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Search Results -

Terms	Documents
L13 and l10	108

Database: US Patents Full-Text Database
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Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L14

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DATE: Thursday, May 29, 2003 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ			
L14	L13 and l10	108	L14
L13	l2 same l9	1720	L13
L12	L11 and l10	281	L12
L11	l2 same l3	22089	L11
L10	L9 and l6	406	L10
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L8	L7 and l6	358	L8
L7	L3 near (instruction or server or terminal or recognition or suynthesis)	22800	L7
L6	l1 and l2 and l4 and l5	1843	L6
L5	map	181012	L5
L4	traffic	133438	L4
L3	audio or voice or speak$3	542232	L3
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L1	gps or navigation	427829	L1

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L14: Entry 20 of 108 File: PGPB Oct 24, 2002

DOCUMENT-IDENTIFIER: US 20020156570 A1
TITLE: Audio interactive navigation system, moving terminal device, and audio interactive server

Abstract Paragraph (1):
The present invention is characterized in that the car navigation system for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution the information is composed of a moving terminal device which can be operated by inputting and outputting voice, a communication device, an audio interactive server which can input and output voice and data, is connected to an external device and the Internet on the basis of audio interactions by the voice recognition process and voice synthesis process, and executes information transfer, and one or a plurality of information distribution service providers connected to the Internet for distributing information such as map information and traffic information.

Summary of Invention Paragraph (2):
[0001] The present invention relates to a car navigation art for receiving information and services from an information distribution service provider for distributing map information and traffic information by accessing a network by voice from a moving terminal device such as a car.

Summary of Invention Paragraph (3):
[0002] As a car navigation art for inputting and executing destination setting and telephone number access by holding a conversation by voice, Japanese Application Patent Laid-Open Publication No. Hei 11-14394 (quoted example 1) may be cited. Further, as an art for accessing information on Internet from voice of a telephone set, Japanese Application Patent Laid-Open Publication No. Hei 10-271223 (quoted example 2) and Japanese Application Patent Laid-Open Publication No. Hei 10-177469 (quoted example 3) may be cited.

Summary of Invention Paragraph (4):
[0003] In the quoted example 1 of the prior art mentioned above, voice recognition is executed by a car terminal device and used for an operation command such as a menu and destination setting such as an address and land mark. However, there are problems imposed in the audio interaction that only voice based on a predetermined interaction can be input in relation to the CPU capacity of the car terminal device and moreover, various information on the Internet cannot be used synthetically. Further, the car terminal device has functions of car navigation and voice recognition, so that it is an expensive terminal. Further, map information is stored in CD-ROM or DVD-ROM, so that there is another problem imposed in maintenance such as periodic updating.

Summary of Invention Paragraph (5):
[0004] Furthermore, in the quoted examples 2 and 3, voice data input by voice is recognized by a voice-Internet gate way or a voice control host device connected to the Internet and on the basis of the result, access to the Internet and searching for information can be made possible. However, a problem arises that the audio interaction is not flexible such that only one object service can be given. Namely, there is a problem imposed that depending on information service distribution, the audio interaction method and voice recognition subject words are different and the quoted examples cannot correspond to them flexibly. In an environment that an instruction can be issued only by voice, map information such as destination setting and traffic

information such as traffic congestion cannot be accessed simply.

Summary of Invention Paragraph (7):
[0005] In consideration of the above-described problems, the present invention is aimed at providing a car navigation art for receiving information and services from an information distribution service provider for distributing map information and traffic information by accessing a network by voice from a moving terminal device such as a car.

Summary of Invention Paragraph (8):
[0006] Thus, in the present invention, a car navigation system for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution the aforementioned information is composed of a moving terminal device which can be operated by inputting and outputting voice, a communication device, an audio interactive server which can input and output voice and data, is connected to an external device and the Internet on the basis of audio interactions by the voice recognition process and voice synthesis process, and executes information transfer, and one or a plurality of information distribution service providers connected to the Internet for distributing information such as map information and traffic information.

Summary of Invention Paragraph (9):
[0007] Further, the moving terminal device is equipped with a means for calling the audio interactive server by one operation such as pressing a button and establishing communication. By doing this, the driver operability can be improved.

Summary of Invention Paragraph (10):
[0008] Further, the moving terminal device is structured so as to receive non-voice data from the audio interactive server and display characters and images on the screen of the moving terminal device. By doing this, intermediate results of the interaction contents can be displayed, so that the operability can be improved.

Summary of Invention Paragraph (11):
[0009] Further, when effective information such as individual information is input to the communication device beforehand and the communication device is installed at a predetermined location of the moving terminal device, the moving terminal device is structured so as to automatically establish communication with the audio interactive server and transmit the information to the audio interactive server. By doing this, information distribution services can be realized in accordance with individual desire.

Summary of Invention Paragraph (12):
[0010] Further, when the communication device is installed at the predetermined location of the moving terminal device, the moving terminal device is structured so as to automatically establish communication with the audio interactive server and receive effective information such as the history at the time of previous access from the audio interactive server. By doing this, for example, the destination can be set in the previous history information and the operation is simplified.

Summary of Invention Paragraph (13):
[0011] Further, the moving terminal device is structured so as to switch voice output between voice output from the audio interactive server and voice output in the moving terminal device after the moving terminal device receives voice data having a specific meaning such as interaction end from the audio interactive server or after the moving terminal device outputs voice data having a specific meaning such as interaction end. By doing this, in a case of typical synthesis guidance, the communication time can be shortened.

Summary of Invention Paragraph (14):
[0012] Further, the moving terminal device is structured so as to automatically transmit predetermined information of non-voice such as present location information held in the moving terminal device to the audio interactive server after the moving terminal device receives voice data having a specific meaning such as interaction end from the audio interactive server or after the moving terminal device outputs voice

data having a specific meaning such as interaction end. By doing this, the protocol between the moving terminal device and the audio interactive server can be shortened.

Summary of Invention Paragraph (15):
[0013] Further, when the audio interactive server requests connection to the moving terminal device via the communication line, the moving terminal device is structured so as to have a certification process function for identifying from a voice response by the moving terminal device that the communication partner is a one from the audio interactive server. By doing this, the audio interactive server can reconnect the voice line whenever necessary and the communication charge can be reduced.

Summary of Invention Paragraph (16):
[0014] Further, the audio interactive server is structured so as to have a command conversion processing unit for performing the voice recognition process on the basis of the input voice, analyzing the contents of the obtained recognition result data, and generating a command to be transferred to the information distribution service provider. By doing this, the audio interactive server can correspond flexibly to the service provider for distributing various information.

Summary of Invention Paragraph (17):
[0015] Further, the audio interactive server is structured so as to internally have an interaction generation template having a described control flow for realizing a basic interaction and an interactive data generation unit for processing data on the basis of the interaction generation template and generating a control flow for realizing an audio interaction suited to obtain desired distribution information. By doing this, a unified interaction template is available and the operability is improved.

Summary of Invention Paragraph (18):
[0016] Further, the audio interactive server is structured so as to have an individual information management unit for controlling distribution information including individual information such as characteristics for each subject to be connected and the destination and route information of search results and to inquire a predetermined information distribution service provider about necessary traffic congestion information and event information via the Internet on the basis of the held route information of the subjects to be connected. By doing this, overall services can be given to each individual using map information and traffic information.

Brief Description of Drawings Paragraph (2):
[0017] FIG. 1 is a drawing showing the whole constitution of the audio interactive navigation system of this embodiment.

Brief Description of Drawings Paragraph (4):
[0019] FIG. 3 is a drawing showing detailed constituent blocks of the audio interactive server 105 of this embodiment.

Brief Description of Drawings Paragraph (7):
[0022] FIG. 6 is a drawing showing the certification processing flow from the car terminal device 100 of this embodiment to the audio interactive server 105.

Brief Description of Drawings Paragraph (8):
[0023] FIG. 7 is a drawing showing the processing flow of an example of navigation services by audio interaction of this embodiment.

Brief Description of Drawings Paragraph (12):
[0027] FIG. 11 is a drawing showing the processing flow of offering traffic information to the car terminal device 100 from the audio interactive server 105 when the traffic information is changed on the route of this embodiment.

Brief Description of Drawings Paragraph (13):
[0028] FIG. 12 is a drawing showing the whole constitution of the audio interactive navigation system when the voice communication processing unit of this embodiment is built in the car terminal device.

Brief Description of Drawings Paragraph (14):
[0029] FIG. 13 is a drawing showing a business model example using the audio

interactive navigation system of this embodiment.

Detail Description Paragraph (3):
[0031] FIG. 1 is an overall block diagram of the audio interactive navigation system of the present invention.

Detail Description Paragraph (4):
[0032] A car terminal device 100 is connected to a mike 101 for realizing voice input, a speaker 102 for outputting voice, a switch 103 for inputting a desired instruction to the car terminal device 100, and a screen 104 which is a data output. The car terminal device 100 internally has a processing unit for realizing voice synthesis of a simple fixed form of sentence with voice recognition and a screen display control unit for displaying desired data on the screen 104. Further, the car terminal device 100 is connected to a GPS 113 having a sensor for executing position measurement and can uniquely measure the position of a car itself.

Detail Description Paragraph (5):
[0033] Further, an audio interactive server 105 and an information distribution service provider (hereinafter referred to as an ASP) 106 for distributing useful information for the navigation of the present invention are connected to each other via a network 107 of the Internet and permit input and output of various kinds of information.

Detail Description Paragraph (6):
[0034] The audio interactive server 105 has a voice communication processing unit 108, a data communication processing unit 109, a voice-data synchronization control unit 110, and various processing units for realizing functions. A detailed constitution of each unit will be described later.

Detail Description Paragraph (7):
[0035] The group information distribution ASP group 106 includes a map information ASP for distributing route information on the basis of the data base concerning maps, a traffic information ASP for distributing a congestion condition of a road and an accident condition on the basis of the data base concerning traffic, and an event information ASP for distributing information of various events.

Detail Description Paragraph (8):
[0036] The car terminal device 100 is connected to the audio interactive server 105 via a telephone line 112 using a communication device 111 and outputs and inputs voice and data. In this explanation, the communication device 111 can be removed from a car and is installed in the neighborhood of the car terminal device 100 when the car is in use and in the other cases, a user can carry and use it.

Detail Description Paragraph (9):
[0037] Further, this system is connected to the Internet network 107 using a household terminal device 114 capable of being connected to the Internet such as a personal computer and the services given by this system can be used.

Detail Description Paragraph (11):
[0039] Hereunder, the service use example in this embodiment will be explained on the consumption of a case that a user makes a trip to Park A. As shown in the drawing, the building where the audio interactive server 105 is installed and each ASP for executing the information distribution service are at distant places, and the route information up to the destination is provided by the map information ASP, and the operation information concerning a plurality of restaurants in Park A which is the destination and on the moving routes is information collected by the event information ASP. Further, the congestion condition of roads including the moving routes of the user and accident information are successively collected by the traffic information ASP.

Detail Description Paragraph (12):
[0040] FIG. 3 is a detailed block diagram of the audio interactive server 105.

Detail Description Paragraph (13):
[0041] The audio interactive server 105 is large and composed of the voice

communication processing unit 108 for performing the voice communication process, the data communication processing unit 109 for performing the non-voice communication process, and a processing unit 311 for performing the other processes.

Detail Description Paragraph (14):
[0042] The voice communication processing unit 108 is composed of a voice recognition processing unit 300 for recognizing input voice and converting it to text data, a voice synthesis processing unit 301 for converting the text data to voice data, a command conversion processing unit 302 for performing the process for converting the text data of the voice recognition processing process 300 to a command for instructing the host CPU and the process for converting the high-order command to text data which is a subject of voice output and outputting it to the voice synthesis processing unit 301, and a calling interface unit 303 for controlling input and output to and from the external communication line and voice communication processing unit. When VoiceXML which is one of marking languages capable of expanding the standard is to be used to realize an audio interaction, the command conversion processing unit 302 is equivalent to the part for performing the interpreter process capable of analyzing the description of VoiceXML.

Detail Description Paragraph (17):
[0045] A service decision unit 304 is a unit for deciding what service information is desired by the command converted by the command conversion processing unit 302, which understands the command on the basis of a service knowledge data base 305 stored internally, selects the necessary subject ASP, and transmits command data for obtaining service information to the external Internet network.

Detail Description Paragraph (20):
[0048] Further, the user information obtained by the certification processing unit 308 is transmitted to an individual information management unit 309 as individual information for each user and stored in an individual information data base 310. The individual information data base 310 can additionally store a user history such as past information search results of each user. The individual information management unit 309 transfers these stored information for each individual user to the interactive data generation unit 306 and the individual information is used as reference for generation of an audio interactive model characterized for each user at the time of service use.

Detail Description Paragraph (23):
[0051] AS shown in the drawing, there are the screen 104 and some switches 103 provided on the front of the device. Information necessary for navigation is displayed on the screen 104, and the display contents are changed over by the switches 103, and various instructions can be given to the car terminal device 100. Further, the car terminal device 100 has an inquiry button 500 having a function for establishing a communication line for the audio interactive server 105 by one operation. Namely, only by pressing the inquiry button 500, a connection for automatically making a telephone call to the audio interactive server 105 and enabling telephone conversation by voice hereafter can be established.

Detail Description Paragraph (25):
[0053] FIG. 6 shows a processing flow of certification when the first connection is established from the car terminal device 100 to the audio interactive server 105 in this system.

Detail Description Paragraph (28):
[0056] When confirming the installation of the communication device 111, the car terminal device 100 establishes data communication for the audio interactive server 105. Thereafter, the car terminal device 100 starts transmission of the individual information input in the communication device 111 beforehand to the audio interactive server 105. The audio interactive server 105 confirms by the internal certification processing unit 308 that the car terminal device 100 is in the operation state on the basis of the ID information included in the received individual information, completes certification, and transmits certification confirmation data to the car terminal device 100. Upon receipt of the certification confirmation data, the car terminal device 100 outputs a predetermined sound or voice and notifies the user of completion of certification. (Step 603)

Detail Description Paragraph (29):
[0057] Thereafter, the audio interactive server 105 obtains desired information of the user confirmed by certification from the individual information data base 310 and transmits it to the car terminal device 100. (Step 604)

Detail Description Paragraph (30):
[0058] In this flow, as another method of the means for giving the individual information input beforehand at Step 601 to the audio interactive server 105, there is a means for connecting to the audio interactive server 105 via the Internet network 107 using the household terminal device 114 such as the PC shown in FIG. 1 and giving the individual information beforehand. In this case, the car terminal device 100 transmits the ID information to the audio interactive server 105 by input indicating that the user gets in the car, thereby performs the certification process.

Detail Description Paragraph (31):
[0059] FIG. 7 shows the process flow of an example of the navigation services by audio interaction in this audio interactive navigation system. The process flow will be explained hereunder using the schematic diagram of the audio interactive server 105 shown in FIG. 3.

Detail Description Paragraph (32):
[0060] When the user intends to receive the service of this system in the car, he firstly presses the inquiry button 500 of the car terminal device 100 and establishes the communication line with the audio interactive server 105. (Step 701)

Detail Description Paragraph (33):
[0061] Upon receipt of it, the audio interactive server 105 generates a audio interactive description necessary to the first audio interaction by the interactive data generation unit 306 and returns a voice response to the car terminal device 100 via the voice communication processing unit 108. The first voice output to be received from the audio interactive server 105 in this case is preferably words for obtaining the request of the user such as "What?". In this example, the user desires assistance for the driving route including route search, so that he responds in voice including a predetermined keyword such as "Route assistance, please". Upon receipt of the voice response of the user, the audio interactive server 105 understands that the request of the user is "Route assistance" by the service decision unit 304 via the voice recognition processing unit 300 and the command conversion processing unit 302 in the voice communication processing unit 108.

Detail Description Paragraph (35):
[0063] This example will be explained on the assumption that the aforementioned user desires "traffic information and event information on moving route" in addition to route assistance.

Detail Description Paragraph (36):
[0064] When the interaction with the user ends and information necessary to route assistance is obtained, the audio interactive server 105 transmits the destination information obtained by the interaction to the map information ASP. (Step 703)

Detail Description Paragraph (37):
[0065] Furthermore, the audio interactive server 105 requests the present position information to the car terminal device 100 and obtains the present position information of the car of the user. (Step 704)

Detail Description Paragraph (38):
[0066] The present position information obtaining method in this case, instead of the method for responding by the car terminal device 100 by a request from the audio interactive server 105, may be a method for automatically transmitting the present position data of the car by the car terminal device 100 after the car terminal device 100 detects voice indicating end of the audio interaction at Step 702 from the audio interactive server 105 or may be a method for automatically transmitting the present position data of the car by the car terminal device 100 after the car terminal device 100 responds to voice indicating end of the audio interaction at Step 702.

Detail Description Paragraph (39):
[0067] When the obtained present position information is transmitted to the map information ASP, the map information ASP searches for the route to the destination on the basis of the destination information and present position information. (Step 705)

Detail Description Paragraph (40):
[0068] The audio interactive server 105 receiving the searched route information from the map information ASP transmits the route information of searching result to the car terminal device 100 together with the detection end signal. (Step 706)

Detail Description Paragraph (41):
[0069] The car terminal device 100 indicates the route on the map displayed on the screen 104 on the basis of the received route information. When new map data is necessary at that time, the car terminal device 100 directly inquires the map information ASP, obtains the necessary map data, and displays a map. (Step 707)

Detail Description Paragraph (42):
[0070] Furthermore, the audio interactive server 105 confirms by the audio interaction at Step 702 that the user also desires "traffic information and event information on moving route", so that the audio interactive server 105 requests a traffic information search on the route to the traffic information ASP after the previous inquiry to the map information ASP is completed. The previously obtained destination information and present position information of the user are stored in the individual information data base 310 in the audio interactive server 105, so that the audio interactive server 105 transmits also these information to the traffic information ASP when requested. (Step 708)

Detail Description Paragraph (43):
[0071] Upon receipt of the request, the traffic information ASP searches for information on the basis of the received traffic information on the route and transmits necessary road information such as congestion information and accident information on the route to the car terminal device 100 via the audio interactive server 105. (Step 709)

Detail Description Paragraph (44):
[0072] Further, separately, the audio interactive server 105 transmits the destination information and individual information such as desire of an event of the user which are stored in the individual information data base 310 to the event information ASP. (Step 710)

Detail Description Paragraph (45):
[0073] Upon receipt of the request, the event information ASP searches for information on the basis of the received destination information and individual information and transmits event information suited to the user to the car terminal device 100 via the audio interactive server 105. (Step 711)

Detail Description Paragraph (46):
[0074] Upon receipt of the answer from the event information ASP, the audio interactive server 105 judging that it obtains all necessary service information transmits the search end data to the car terminal device 100. The car terminal device 100 outputs a predetermined sound or voice after receiving the search end data and notifies the user of search end. (Step 712)

Detail Description Paragraph (49):
[0077] At the stage that the service offering subject of the user is found to be route assistance from the first interaction, the audio interactive server 105 obtains the necessary request command from the service knowledge data base 305. In this case, the audio interactive server 105 obtains, as "destination inquiry" and a desired condition item, request commands of "existence of use of toll road", "existence of desire of traffic information", and "existence of desire of event information". On the basis of these request commands, the audio interactive server 105 prepares interactive data by the interactive data generation unit 306 and obtains information of each item from the user in the interactive form as shown in the drawing using the command conversion processing unit 302, the voice recognition processing unit 300, and the voice synthesis processing unit 301.

Detail Description Paragraph (50):
[0078] During the audio interaction between the user and the audio interactive server 105, pictures corresponding to interaction contents can be displayed on the screen 104 of the car terminal device 100.

Detail Description Paragraph (52):
[0080] As shown in the drawing, whenever the basic interaction is executed between the user and the audio interactive server 105, the command conversion processing unit 302 transmits a signal indicating one interaction execution or completion to the voice-data synchronization control unit 110. The voice-data synchronization control unit 110 obtains the screen display information corresponding to interaction stored in the service knowledge data base 305, transmits the screen display information synchronized with the audio interaction to the data communication processing unit 109, and transfers it to the car terminal device 100.

Detail Description Paragraph (56):
[0084] The voice output of a fixed form of sentence such as "What?" at the beginning of interaction and "Search. Wait a moment" at the last of interaction which are explained previously may be voice output from the audio interactive server 105 or voice output stored in the car terminal device 100 by the car terminal device 100 itself using voice data.

Detail Description Paragraph (57):
[0085] In the latter case, it is desirable to switch the voice output subject using the interaction contents executed between the car terminal device 100 and the audio interactive server 105 and data transferred between them as a trigger. For example, the voice output "What?" may be switched to an internal voice data output after the car terminal device 100 confirms that the first connection request is established and the last voice output "Search. Wait a moment" may be automatically switched to an internal voice data output after the car terminal device 100 detects an interaction of "setting end or not".

Detail Description Paragraph (58):
[0086] The above explanation is made on the assumption of the service request of "route assistance". Also when service information other than that is to be obtained, a flow that interaction is activated by pressing the inquiry button 500, and necessary information is extracted by the interaction with the audio interactive server 105, and the audio interactive server 105 requests the information distribution service provider group 106, and the results are obtained by the user is almost the same.

Detail Description Paragraph (59):
[0087] This audio interactive navigation system, separately from the so-called inquiry type navigation information obtaining method mainly by a user explained above, also provides a navigation information obtaining method for positively offering information to a user mainly by the audio interactive server 105. For example, when the user is moving to the destination and the road condition on the moving route is congested extremely due to an unexpected situation, a service of transmitting information of a difficult traffic condition due to an accident to the user may be cited.

Detail Description Paragraph (60):
[0088] FIG. 11 shows a processing flow of offering information to the car terminal device 100 from the audio interactive server 105 when the traffic information on the searched route is changed.

Detail Description Paragraph (61):
[0089] The assumption in this case is that the user already finishes the certification and route search up to the destination and the user moves to the destination on the basis of the route searching results. Further, the route information of the user is already stored in the individual information data base 310 in the audio interactive server 105 and the audio interactive server 105 can optionally refer to the route information.

Detail Description Paragraph (62):
[0090] The audio interactive server 105 completes the route assistance process shown

in FIG. 2, obtains the route information of the user, then periodically transmits a traffic information request and the obtained route information to the traffic information ASP, and obtains traffic information around the route from the traffic information ASP. (Step 1101)

Detail Description Paragraph (63):
[0091] The audio interactive server 105 checks the contents of the traffic information obtained by the service decision unit 304 and judges whether there is information to be notified to the user from the viewpoint of contents such as unexpected traffic congestion or an accident or not. When the audio interactive server 105 judges that there is no need to notify, it discards the result from the ASP, outputs a traffic information request and the route information to the traffic information ASP again, and continues the periodic process. (Step 1102)

Detail Description Paragraph (64):
[0092] On the other hand, when the audio interactive server 105 judges that the contents to notify to the user are included, it outputs a present position request to the car terminal device 100 of the user and obtains latest information of the present position of the user. (Step 1103) As an other method for obtaining the present position, under the condition that the car terminal device 100 cannot accept the present position request depending on the car condition of the user, a method for inferring the present position by the information stored in the individual information data base 310 such as the car speed condition obtained beforehand is available.

Detail Description Paragraph (65):
[0093] The audio interactive server 105 checks the traffic information previously obtained with the car position information of the user and judges whether the information to be notified to the user is effective or not from the position relationship of the car. When the audio interactive server 105 judges that there is no need to notify, it discards the result from the ASP, outputs a traffic information request and the route information to the traffic information ASP again, and continues the periodic process. (Step 1104)

Detail Description Paragraph (66):
[0094] When the information to be notified to the user is effective, the audio interactive server 105 generates audio interactive data including the information to be notified by the interactive data generation unit 306, establishes the communication line to the car terminal device 100 of the subject car, and then executes voice output to the car terminal device 100 via the command conversion processing unit 302 and the voice synthesis processing unit 301. Whenever necessary, the audio interactive server 105 transmits the congestion information and accident information for screen display in synchronization. (Step 1105)

Detail Description Paragraph (67):
[0095] When a different request such as route changing is generated due to the obtained information, the user inquires the audio interactive server 105 again according to the flow shown in FIG. 7 and updates the information.

Detail Description Paragraph (68):
[0096] As a different constitution of the audio interactive navigation system of the present invention, there is a constitution available that the unit concerning the voice communication process in the audio interactive server is built in the car terminal device.

Detail Description Paragraph (69):
[0097] FIG. 12 is another whole block diagram of the audio interactive navigation system.

Detail Description Paragraph (70):
[0098] A car terminal device 1200 in this example internally has the voice recognition processing unit 300 and the voice synthesis processing unit 301 which are installed in the audio interactive server 105 and has a screen display control unit for displaying desired data on the screen 104. Furthermore, the car terminal device 1200 has the voice-data synchronization control unit 110 for synchronizing the screen output with the voice output. Furthermore, the car terminal device 1200 has the command conversion

processing unit 302 for performing the process for converting the text data of the voice recognition processing process 300 to a command for instructing the host CPU and the process for converting the high-order command to text data which is a subject of voice output and outputting it to the voice synthesis processing unit 301. Further, the car terminal device 1200 is connected to the mike 101 for realizing voice input, the speaker 102 for outputting voice, the switch 103 for inputting a desired instruction to the car terminal device 1200, and the screen 104 which is a data output. Further, the car terminal device 1200 is connected to the GPS 113 having a sensor for executing position measurement and can uniquely measure the position of the car itself.

Detail Description Paragraph (71):
[0099] An audio interactive server 1205 in this example has a built-in unit concerning voice communication in the car terminal device 1200, so that the processing unit of the audio interactive server 105 concerning the unit is eliminated and the audio interactive server 1205 communicates with the car terminal device 1200 only by data communication.

Detail Description Paragraph (73):
[0101] In this constitution, the main part concerning the interface of audio interaction is executed by the car terminal device 1200 and a difference from the constitution explained previously is that data concerning voice exchanged between the car terminal device 1200 and the audio interactive server 1205 is interactive data such as VoiceXML.

Detail Description Paragraph (74):
[0102] Next, a business model example using the audio interactive navigation system of this embodiment will be explained.

Detail Description Paragraph (75):
[0103] FIG. 13 shows a business model example using the audio interactive navigation system of this embodiment.

Detail Description Paragraph (76):
[0104] The business model of this example includes an audio interactive service company 1301 for managing and operating the audio interactive server 105 explained above, a carrier company 1302 for supplying communication lines, an Internet connection service company 1303 for offering connection services with the Internet network 107, an information distribution company 1304 for distributing information such as map information ASP and traffic information ASP, an advertising agent 1305 for carrying an advertisement of products on the contents offered by the information distribution company 1304, an advertiser 1306 for manufacturing products to be advertised, a car terminal device manufacturer 1307 for manufacturing the car terminal device 100, and a service user 1308 for using this service using the car terminal device 100. The advertising agent 1305 may be managed by the advertiser 1306.

Detail Description Paragraph (78):
[0106] The service user 1308 pays the communication charge to the carrier company 1302 so as to use the communication line. On the other hand, the carrier company 1302 offers the communication line to the service user 1308 or the audio interactive service company 1301 and requests the communication charge and service charge at the time of use of this service to the service user 1308. Then, the carrier company 1302 pays the amount equivalent to the service charge among the charge collected from the service user 1308 to the audio interactive service company 1301.

Detail Description Paragraph (79):
[0107] Further, the audio interactive service company 1301 for offering this service and the information distribution company 1304 for distributing service information make a contract with the Internet connection service company 1303 respectively so as to connect to the Internet and thereafter pay the rental fee under the contract.

Detail Description Paragraph (82):
[0110] According to the present invention, the audio interactive navigation system is composed of the moving terminal device capable of inputting voice, communication device, audio interactive server capable of executing voice recognition and synthesis

which is to be connected to the information distribution service provider, and information distribution service provider including map information and traffic information, thus a plurality of information distribution services are joined synthetically and information desired by a driver can be offered. Further, the moving terminal device can be made inexpensive because the function is simplified. Further, necessary services can be given by voice, so that there is an effect produced that the operability is greatly improved.

CLAIMS:

1. An audio interactive navigation system for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution said information and notifying a driver and a fellow passenger of said obtained information, comprising: a moving terminal device capable of being operated by inputting and outputting voice and outputting voice and data to an external device, a communication device capable of connecting a communication line to an outside in said car, an audio interactive server which can input and output voice and data, is connected to said external device and Internet on the basis of audio interactions by a voice recognition process and a voice synthesis process, and executes information transfer, and one or a plurality of information distribution service providers connected to said Internet for distributing information such as map information and traffic information.

2. A moving terminal device for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution said information and notifying a driver and a fellow passenger of said obtained information, wherein said moving terminal device transmits input voice data to an audio interactive server for executing audio interactions by a voice recognition process and a voice synthesis process via a communication device capable of connecting a communication line to an outside in said car, thereby interprets and executes said voice data, obtains said information such as map information and traffic information from said information distribution service provider, and receives said results from said audio interactive server by voice or data.

3. A moving terminal device according to claim 2, further comprising: input means for starting said communication device by one operation and establishing communication for said audio interactive server.

4. A moving terminal device according to claim 2, wherein: said moving terminal device has a screen for displaying images of character information and map information and displays interaction contents during audio interaction on said screen.

5. A moving terminal device according to claim 2, wherein: when effective information such as individual information is input to said communication device beforehand and said communication device is installed in a predetermined place of said moving terminal device, said moving terminal device automatically establishes communication with said audio interactive server and transmits said information to said audio interactive server.

6. A moving terminal device according to claim 2, wherein: when said communication device is installed in a predetermined place of said moving terminal device, said moving terminal device automatically establishes communication with said audio interactive server and receives effective information such as a history at the time of previous access from said audio interactive server.

7. A moving terminal device according to claim 2, wherein: said moving terminal device switches voice output between voice output from said audio interactive server and voice output in said moving terminal device after said moving terminal device receives voice data having a specific meaning such as interaction end from said audio interactive server.

8. A moving terminal device according to claim 2, wherein: said moving terminal device switches voice output between voice output from said audio interactive server and voice output in said moving terminal device after said moving terminal device

transmits voice data having a specific meaning such as interaction end.

9. A moving terminal device according to claim 2, wherein: said moving terminal device automatically transmits predetermined information of non-voice such as present location information held in said moving terminal device to said audio interactive server after said moving terminal device receives voice data having a specific meaning such as interaction end from said audio interactive server.

10. A moving terminal device according to claim 2, wherein: said moving terminal device automatically transmits predetermined information of non-voice such as present location information held in said moving terminal device to said audio interactive server after said moving terminal device transmits voice data having a specific meaning such as interaction end.

11. A moving terminal device according to claim 2, wherein: when said audio interactive server requests connection to said moving terminal device via said communication line, said moving terminal device has a certification process function for identifying from a voice response by said moving terminal device that a communication partner is a one from said audio interactive server.

12. An audio interactive navigation system for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution said information and notifying a driver and a fellow passenger of said obtained information, comprising: a moving terminal device which has an interface for inputting and outputting voice, internally has a voice recognition processing function and a voice synthesis processing function, and can execute transfer of information with an external device by an operation on the basis of audio interactions, a communication device capable of connecting a communication line to an outside in said car, an audio interactive server connected to said external device and Internet according to an instruction from said moving terminal device for executing information transfer, and one or a plurality of information distribution service providers connected to said Internet for distributing information such as map information and traffic information.

13. A moving terminal device for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution said information and notifying a driver and a fellow passenger of said obtained information, wherein: said moving terminal device has an interface for inputting and outputting voice, internally has a voice recognition processing function and a voice synthesis processing function, generates operation command data on the basis of audio interactions, transmits said operation command data to an audio interactive server via a communication device for connecting a communication line to an outside in said car, thereby executes said operation command data, obtains said map information and said traffic information from said information distribution service provider, and receives data of said results from said audio interactive server.

14. An audio interactive server with navigation for, at the time of desiring map information, traffic information, and other required information in a car, inquiring an information distribution service provider for distribution said information and notifying a driver and a fellow passenger of said obtained information, comprising: a command conversion processing unit for performing a voice recognition process on the basis of voice input to said audio interactive server, analyzing contents of said obtained recognition result data, and generating a command to be transferred to said information distribution service provider.

15. An audio interactive server according to claim 14, wherein: said audio interactive server has a service knowledge data base concerning distribution information in said command conversion processing unit, performs said voice recognition process on the basis of said voice input to said audio interactive server, analyzes said contents of said obtained recognition result data using said service knowledge, and generates said command to be transferred to said information distribution service provider.

16. An audio interactive server according to claim 14, wherein: said audio interactive server internally has an interaction generation template having a described control

flow for realizing a basic interaction and an interactive data generation unit for processing data on the basis of said interaction generation template and generating a control flow for realizing an audio interaction suited to obtain desired distribution information.

17. An audio interactive server according to claim 14, wherein: said audio interactive server has an individual information management unit for controlling distribution information including individual information such as characteristics for each subject to be connected and a destination and route information of search results.

18. An audio interactive server according to claim 17, wherein: said audio interactive server inquires a predetermined information distribution service provider about necessary traffic congestion information and event information via Internet on the basis of said route information of said subjects to be connected which is held in said individual information management unit.

19. An audio interactive server according to claim 17, wherein: said audio interactive server has a processing unit for inquiring a moving terminal device of said subject to be connected about a present place of said subject to be connected when information is received as a result of inquiring said predetermined information distribution service provider and judging whether said result information obtained from said information distribution service provider is effective to a latest car position of said subject to be connected or not.

20. An audio interactive server according to claim 14, wherein: said audio interactive server has a processing unit for, when said moving terminal device cannot receive voice output data when said voice output data is to be transmitted to said moving terminal device, transmitting data of non-voice to said moving terminal device and notifying that there is voice output data to be received by said moving terminal device.

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TITLE: Vehicular sound-processing system incorporating an interior mirror user-interaction site for a restricted-range wireless communication system

Summary of Invention Paragraph (6):
[0006] An additional issue with communication devices in vehicles is that when the device is in use, the user may not be certain that the message conveyed is properly received by the other party. This may be especially troublesome when the other party is an automated voice system which responds to a particular voice communication. When a remote receiving system is operating in voice recognition mode, it is particularly important that alphanumeric speech text is accurately received and interpreted by the remote party. Thus, for example, if the vehicle operator says "Call Dan at extension three-five-seven-nine-six", it is important that the remote party (which often is a computer-based machine voice recognition system that is operating in voice recognition mode) interprets this correctly and initiates the requested call, e.g., to Dan at Ext: 35796. In a vehicle environment, ambient noise from the like of traffic noise, road noise, wind noise, HVAC noise and engine noise can make it difficult for the remote party to voice recognize with clarity and accuracy the message being telecommunicated.

Summary of Invention Paragraph (17):
[0016] In one form, an interior rearview mirror digital sound processing system suitable for use in a vehicle equipped with an audio system is provided comprising an interior rearview mirror assembly. The interior mirror assembly includes at least one microphone capable of producing an audio output in response to detection of vocal input. The vocal input signal has vehicle cabin noise (such as from road noise, HVAC noise, wind noise, windshield noise, traffic noise engine noise etc) superimposed thereon. The interior mirror assembly further includes a digital sound processor. The digital sound processor receives a signal indicative of the microphone audio output; and the digital signal processor processes the signal indicative of the microphone audio output and provides an output vocal signal with substantially reduced vehicle cabin noise.

Detail Description Paragraph (3):
[0035] As shown in FIG. 2, mirror assembly 16 may include a conventional mounting button 16a and a mirror housing 16b supporting a prismatic, electro-optic or electrochromic reflective element 16d. Mounting button 16a may be adhesively secured to interior surface 12b of windshield 12 at a location substantially below forward edge 14a of headliner 14 and upper edge 12a of windshield 12, as is known in the art. Mirror housing 16b is pivotally mounted to mounting button 16a via an arm 16c, which is pivotally interconnected to button 16a or housing 16b, or both, such that housing 16b is pivotally adjustable about mounting arm 16c. Alternately, mounting arm 16c terminates at the vehicle headliner to pivotally mount the mirror assembly to the headliner of the vehicle. Mirror housing 16b encases a reflector 16d (FIG. 7) for reflecting an image of a scene generally rearwardly of the vehicle to the driver (and with the mirror housing being adjustable by the driver), and a bezel 16e which retains reflector 16d in housing 16b, as is well known in the art. Mirror wire harness 24 extends generally upwardly from mirror housing 16b to headliner 14 for electrical connection with a vehicle wiring harness 28 (FIG. 3). Mirror wire harness 24 provides electrical power and/or control signals to the mirror assembly 16 or various mirror mounted accessories within assembly 16, such as power for electrooptic/electrochromic mirrors, interior lights (such as map lights in the mirror housing), and displays such

as for compass headings, temperatures, passenger airbag status, or the like.

Detail Description Paragraph (12):
[0044] The audio system and microphone may further include a learning mode, whereby the audio system/microphone combination learns the vocal characteristics of a particular driver or occupant, so that the ratio of vocal signals to non-vocal noise signals received by the system can be enhanced. The learning mode may be operable in a memory system, such as is known in the automotive art, whereby a group of drivers and/or occupants, typically one, two or three individuals, may be recognizable by the audio system. The learning mode may be operable to recognize a particular individual's voice via the operator selecting the learning mode and speaking a brief message to the microphone. The audio system then receives the individual's voice message and repeats the message back to the individual via a speaker or alphanumeric display. This process is continued until the message is accurately recognized and repeated by the audio system. The recognized vocal characteristics may then be stored to memory for future use by the individual. A security feature for the audio system and/or any vehicle accessory and/or the vehicle itself can be provided via voice recognition.

Detail Description Paragraph (14):
[0046] By providing an indication of the receiving status of vocal signals received by the audio system, the present invention significantly reduces the possibility that a message will not be received clearly, correctly, and/or accurately by the receiving party. The vehicle based user of the audio system is alerted immediately if the microphone is not adequately receiving and/or is not adequately/correctly/accurately interpreting the message and/or if the other party to the communication is not adequately receiving the message. Accordingly, the user may speak up or speak more clearly, or adjust the volume of other noises or conversations within the vehicle to correct the reception concerns. The user may also re-send the message if it was not properly being received by the other party. The present invention is especially useful when the other party is an automatic or computer based voice recognition system. The user in the vehicle will be alerted by indicator 72 that the message sent may not have been properly received by the voice system and may then re-send the message or try again later in order to ensure that the message is properly received.

Detail Description Paragraph (33):
[0065] As shown in FIG. 6, microphone module 10 may further include manual controls for the audio or communication device associated with microphone 18, such as buttons 44 for activating and/or adjusting the communication device. Microphone module 10 may further include other manual controls 46 for activating or adjusting other accessories or devices within the vehicle, such as interior or exterior lights, or for selecting a function for microphone 18, such as a cellular phone versus an emergency communication device or recording device. Mirror housing 16b may also include controls, buttons or switches, shown generally at 48, for selectively activating, deactivating or adjusting one or more accessories associated with the vehicle. For example, controls 48 may activate map reading lights on mirror housing 16b, temperature displays, compass heading displays or the like, which may be displayed on a portion of mirror housing 16b and are thus easily visible to the driver of the vehicle. Alternatively, however, controls 46 and 48 on microphone module 10 and mirror housing 16b, respectively, may control accessories or lights which are located on or within the vehicle and yet are remote from microphone module 10 and mirror 16.

Detail Description Paragraph (34):
[0066] Referring now to FIG. 7, an accessory module 10' may further include multiple accessories, components or devices associated with various control systems of the vehicle and connected with a vehicle control or the vehicle wiring harness. For example, accessory module 10' may include a microphone 18, an indicator 72, a loudspeaker 42, a Global Positioning System (GPS) antenna 50, a motion sensor 52, a rain sensor 54, a video device or camera 56, an interior light 58, an automatic toll booth transducer 59, a security system status indicator 70, a compass and/or compass sensor 51, a temperature displav and/or temperature sensor 53, a tire pressure indicator display 55, a seat occupancy detection antenna and/or transducer 57, and/or any other devices, components or circuitry which may be useful to mount in accessory module 10'. Preferably, camera 56 is a pixelated imaging array sensor, such as a CMOS imaging array or the like, a description of which is disclosed in commonly assigned U.S. Pat. No. 5,670,935, issued to Schofield et al., the disclosure of which is hereby

incorporated herein by reference. The module 10' may provide a location for these devices which is highly visible and eases user interface by the driver or passengers of the vehicle. Furthermore, mirror housing 16b may also include electrical devices and electronic components, such as other microphones 18, indicators 72 and loudspeakers 42, map reading lights 60, compass 62, display 64, trip computer 66, or other components or devices associated with the vehicle. Mirror harness 24 may provide power and/or control signals to these components or devices and may interconnect with the control circuitry of the devices and of an electrochromic mirror function control circuitry 68 for electronically adjusting the reflectivity of reflector 16d within mirror housing 16b. Display 64 may display vehicle status or information displays, such as compass headings, interior or exterior temperatures, clock display, fuel level display, air bag status display, telephone dial information display, or other status displays of various components or devices associated with the vehicle. Information displayed in display 64 may be selectively displayed by an operator via controls 48 (FIG. 6), or may be cyclically displayed or may be displayed when there is a change in status of one of the devices.

Detail Description Paragraph (41):
[0073] Interior rearview mirror assembly 16 may house a plurality of electrical or electronic devices, such as antennas, including global positioning system (GPS) or cellular phone antennas, such as disclosed in U.S. Pat. No. 5,971,552, a communication module, such as disclosed in U.S. Pat. No. 5,798,688, displays such as shown in U.S. Pat. No. 5,530,240 or in U.S. pending application Ser. No. 09/244,726, filed Feb. 5, 1999, and copending application Ser. No. 09/448,700, entitled "REARVIEW MIRROR ASSEMBLY WITH ADDED FEATURE MODULAR DISPLAY" filed Nov. 24, 1999, by Timothy Skiver et al., blind spot detection systems, such as disclosed in U.S. Pat. Nos. 5,929,786 or 5,786,772, transmitters and/or receivers, such as garage door openers, a digital network, such as described in U.S. Pat. No. 5,798,575, a high/low head lamp controller, such as disclosed in U.S. Pat. No. 5,715,093, a memory mirror system, such as disclosed in U.S. Pat. No. 5,796,176, a hands-free phone attachment, a video device for internal cabin surveillance and/or video telephone function, such as disclosed in U.S. Pat. Nos. 5,760,962 and 5,877,897, a remote keyless entry receiver, map lights, such as disclosed in U.S. Pat. Nos. 5,938,321; 5,813,745; 5,820,245; 5,673,994; 5,649,756; or 5,178,448, microphones, such as disclosed in U.S. patent applications Ser. No. 09/361,814, filed Jul. 27, 1999, 09/396,179, filed Sep. 14, 1999, and 09/199,907, filed Nov. 25, 1998, speakers, a compass, such as disclosed in U.S. Pat. No. 5,924,212, seat occupancy detector, a trip computer, a wireless vehicle-based telematic/telecommunications system such as an ONSTAR.TM. System or the like, with all of the referenced patents and applications commonly assigned to Donnelly Corporation, the disclosures of which are herein incorporated by reference in their entireties.

Detail Description Paragraph (42):
[0074] Referring to FIG. 10, mirror assembly 116 preferably includes a circuit board 118, which includes electronic or electrical circuitry for actuating the variable reflectance of reflective element 114 and for operating other electrical or electronic functions supported in rearview assembly 116. Circuit board 118 may support, for example, light emitting diodes (LED's) for illuminating indicia on display elements provided on chin or eyebrow portion of case bezel region 123 or display areas provided on reflective element 114, or map or dash board lights 140. Circuit board 118 may be independently supported from reflective element 114 or in casing 112 or may be mounted to rear surface 14a of the reflective element on a separate plate or may be directly adhered to the rear surface by a suitable adhesive. Reference is made to U.S. Pat. Nos. 5,671,996 and 5,820,245, the disclosures of which are herein incorporated by reference in their entireties. It should be understood that one or more user actuatable buttons or one or more information displays may be located elsewhere on the mirror assembly or separately in a module, for example of the type disclosed in pending U.S. patent application Ser. No. 09/244,726 entitled "REARVIEW MIRROR ASSEMBLY INCORPORATING VEHICLE INFORMATION DISPLAY", filed by Jonathon E. DeLine and Niall R. Lynam, which is assigned to Donnelly Corporation of Holland, Michigan, the disclosure of which is herein incorporated by reference in its entirety.

Detail Description Paragraph (44):
[0076] For example a display screen mounted at or part of rearview mirror assembly 16 (such as part of moveable housing 16b or of module 10 or attached to mounting arm 16c or viewable through reflector 16d or attached to mirror button 16a or attached to the

mount of arm 16c to button 16a) can form a viewing screen for a baby minder system, such as the vehicle interior monitoring system described in U.S. Pat. Nos. 5,877,897 and 5,760,962 or the rear vision system described in pending U.S. patent applications Ser. No. 09/361,814, filed Jul. 27, 1999 and Ser. No. 09/199,907 filed Nov. 25, 1998, and U.S. patent application Ser. No. 09/433,467, filed Nov. 4, 1999, entitled "VEHICLE INTERIOR MIRROR ASSEMBLY" to Patrick Heslin and Niall R. Lynam, all of which are incorporated by reference in their entireties herein. An interior surveillance system permits the driver of the vehicle to observe behavior or the activities of babies or children or other passengers seated in the rear seat. This is especially advantageous when the child or baby is in a rearward facing car seat, where the child or baby would ordinarily not be visible to the driver while driving. For example, a camera, such as a CMOS or CCD camera, can be mounted to view the rear seat area of the vehicle so that the driver can view what is occurring, such as in a rear seat mounted baby seat or with a rear seat passenger such as children. Preferably, to enable viewing of the rear seat occupant or occupants even by night, the target field of view of the camera may be illuminated in a manner that provides adequate visibility for the camera to discern what is occurring in the rear seat in a darkened vehicle cabin but not illuminating in a manner that causes glare, distraction, and/or discomfort to any vehicle occupants, including the driver and/or rear seat passengers. For example, such a rear seat monitoring camera illumination is preferably achieved using directed low level non-incandescent light sources, such as light emitting diodes (LEDs), organic light emitting material, electroluminescent sources (both organic and inorganice), and the like, and most preferably such non-incandescent sources are low power and are directed low intensity sources, such as described in U.S. Pat. No. 5,938,321 and copending application entitled "INTERIOR MIRROR ASSEMBLY FOR A VEHICLE INCORPORATING A SOLID-STATE LIGHT SOURCE", Ser. No. 09/287,926, filed Apr. 7, 1999, which are incorporated herein by reference in their entireties. The baby minder camera may be mounted as a part of the rearview mirror assembly and, most preferably, may be mounted as a part of a roof area of the interior vehicle cabin such as a header, including a front header of a roof or a rear header or a header console of a roof. It may be desirable to mount a baby minder camera to the rear header of a roof when it is desirable to view rear facing child support seats. Most preferably, a plurality of at least two, more preferably at least four, and most preferably at least six LEDs (or similar low level, directed, low-current light sources such as electroluminescent sources and organic light emitting sources) are mounted with a camera (preferably, such as to form a ring around the camera) with the light projected from the individual LEDs directed to be coincident with the camera field of view and to illuminate the target area desired to be viewed. The LEDs being directed low level sources will not glare or cause discomfort to occupants when illuminated. Further, camera illumination sources can be illuminated whenever the ignition switch is on to operate the vehicle or at least when the ignition switch is placed in an "accessory on" position so that both the camera and illumination lights are operating on vehicle battery power even when parked. Alternately, the illumination lights can be operational only when the baby minder camera is selected to be operational. While it is preferred to use non-incandescent lights, incandescent light sources can be used, most preferably high intensity, low current incandescent light sources. For example, when the camera is activated to view the rear seat or to view a baby seat or the like, the dome light in the vehicle, which typically comprises an incandescent light source, can illuminate so that the rear seat area is illuminated to assist visibility for the camera. A circuit or other device can be provided that illuminates the dome light (or a similar rear seatilluminating interior light source such as a rail lamp or the like) whenever the camera is selected to view the rear seat. Optionally, the dome light or similar interior light within the interior cabin, once caused to illuminate when the camera is activated, can cease to illuminate after a determined time interval (such as 5 seconds or ten seconds or longer) under the control of a timeout circuit or device. By providing a timeout, the driver can selectively view the status of passengers in the rear seat of the vehicle by selecting a baby-minder camera or similar rear seat viewing function (such as by voice command, user-operated switch or the like). Upon selection of the camera function, whatever is being viewed on the video screen in the vehicle may be interrupted (or superimposed over or the like), the interior light in the cabin (such as the dome light) will illuminate, a timeout will initiate, and the driver (or other front-seat occupant) can view the rear seat status for the duration of the timeout. Once the timeout elapses, the interior light ceases to illuminate, and preferably, the camera ceases to be activated and the video screen reverts to its pre-event status. Optionally, a reverse-aid rearward viewing camera can be mounted to

the rear of the vehicle in order to display to the driver, upon selecting a reverse gear, a field of view immediately rearward of the vehicle so as to assist the driver in reversing the vehicle. Such vehicle reverse-aid camera systems are disclosed in U.S. patent application Ser. No. 09/361,814 entitled "Wide Angle Imaging System" to Bos of Donnelly Corporation, filed Jul. 27, 1999, and in U.S. patent application Ser. No. 09/199,907 entitled "Wide Angle Image Capture System for Vehicle" to Bos et al of Donnelly Corporation, filed Nov. 25, 1998, and in U.S. patent application Ser. No: 09/313,139 entitled "Rearview Vision System With Indicia Of Backup Travel" to Schofield et al. of Donnelly Corporation, filed May 17, 1999, the disclosures of which are hereby incorporated by reference herein. For example, when the driver selects a reverse gear, a view of the back-seat of the vehicle is automatically replaced with a view rearward of the vehicle provided by the rearward facing reverse-aid camera (typically mounted at the vehicle rear license plate area or the like) and when reverse gear is disengaged, the view of the back-seat is once again displayed at the display screen visible to the driver in the interior cabin of the vehicle (such as at, on or in mirror assembly 16). Also, when a baby is small, a rear-facing child seat is preferred (i.e. the child faces the rear of the vehicle cabin) whereas as the child grows, a forward facing child seat is preferred. In order to cater for forward-facing child seats versus rearward-facing child seats, two cameras can be mounted such as in the roof area of the vehicle. One forward viewing camera (i.e. viewing forward of the vehicle relative to the direction of forward motion of the vehicle) can be mounted at a roof location (such as above the vehicle rear window) to view a baby seated in a rear-facing baby seat and a second rearward viewing camera (i.e. viewing rearward of the vehicle relative to the direction of forward motion of the vehicle) can be mounted at a roof location (such as above the vehicle front windshield or as part of mirror assembly 16) to view a child seated in a forward-facing baby seat. A switch can be provided to allow the driver to choose to use any one of the forward viewing camera and the rearward viewing camera. Optionally and preferably from a cost viewpoint, a single camera module can be provided that can connect to and/or dock into two or more spaced and separate camera module receiving stations. One (i.e. a first) camera module receiving station can be high-mounted at a forward location in the vehicle cabin (such as in a header console above and adjacent the front windshield or in the headliner above and adjacent the front windshield or as part of mirror assembly 16) and a second camera module receiving station can be located at a rearward location in the vehicle cabin (such as above and adjacent to the rear window, or at a position in the headliner of the vehicle that is located above and rearward of the rear seat, or as part of a dome lamp or other interior lighting assembly, preferably a lighting assembly comprising a plurality of light emitting diodes and most preferably a lighting assembly comprising a plurality of light emitting diodes comprising at least one white light emitting diode) that is spaced and separate from the location of the first camera receiving station. A single camera module can be provided that plugs into, and electrically/electronically connects to, any one of the two camera receiving stations provided. When the camera module is plugged into the first camera receiving station, the camera field of view is directed rearwardly in the vehicle cabin to monitor a back seat area and thus monitor a child strapped in a forwardly facing child seat and the like. The camera receiving station provides power to the camera and receives video signals generated by the camera. If, however, a rearward facing baby seat was mounted on the rear seat, the driver can unplug the camera module from the first camera receiving station and plug it into the second camera receiving station. When plugged into the second camera receiving station, the camera lens faces forwardly in the cabin and its field of view is directed to capture and hence display the rearward facing baby strapped in the rearwardly facing baby (or child) seat. Optionally, a plurality of camera receiving stations (such as three or four or more) can be provided to allow a single camera be mounted at a plurality of locations in a vehicle cabin with its field of view selected to be directed to a specific portion of the vehicle cabin by plugging the camera module into a specific one of the available plurality of camera receiving stations. This allows a "plug and view" capability for the vehicle user. As an alternate, or as a supplement, to a plurality of camera receiving stations, a camera can be movably mounted on a rail that also functions as a power strip that is affixed to an interior vehicular cabin structure such as a headliner of the vehicle or to a window of a vehicle (such as is disclosed in U.S. patent application Ser. No: 08/895,729 entitled "Vehicle Window Assembly For Mounting Interior Vehicle Accessories" to John W. Carter et al. of Donnelly Corporation, filed Jul. 17, 1997, the entire disclosure of which is hereby incorporated by reference herein). Thus, for example, a camera can move along a channel in a rail attached to a

vehicle cabin roof headliner. When stopped at a particular position along the rail, the camera module can receive power input from, and deliver signal output to, the rail such as via conductive brush connectors such as carbon brushes. Alternately, the camera module can transmit video image data wirelessly within the cabin, such as by infrared or by radio-frequency transmission, to a cabin-mounted receiver (or externally of the vehicle to a remote receiver such as might be used in a cabin security monitoring camera-based system that, for example, monitors the interior vehicle cabin while the vehicle is parked in order to detect intrusion by an unauthorized party). Optionally, the camera module mounted in the vehicle cabin is detachably mounted so that it can be removed from the vehicle both as an anti-theft device and in order to allow the camera to be used outside the vehicle such as in a child's crib in a home. In this regard, a video camera (such as the detachable vehicle camera module) can be mounted at a distance from the vehicle such as in the like of a child's bedroom in a house to monitor, for example, a child sleeping in a crib, and its video image can be wirelessly transmitted (such as by radio-frequency transmission) or transmitted via a wireless INTERNET linkage to the vehicle so the driver and/or other occupants of the vehicle can view the video image of the child in the crib at home on a vehicular video screen, preferably on a screen mounted at, on or in mirror assembly 16, while the vehicle is located and operating at a distance from the location of the home where the camera generating the video image is located. Also, the camera used in the applications described above can be an autofocusing and/or autoexposure camera using an autofocusing lens system and/or an autoexposure system (such as via an automatically adjustable iris system). Also, optionally, the field of view of the lens of the camera can be adjusted to view a multitude of locations in the vehicle cabin such as by ajoystick-control or the like.

Detail Description Paragraph (45):
[0077] The display element located at or as part of interior mirror assembly 16 may perform a single display function or multiple display functions, such as providing indication of an additional vehicle function or functions, for example a compass mirror display function, a temperature display function, a tire pressure/status display function, a status of inflation of tires display function, computer display including e-mails and INTERNET access, a passenger air bag disabled display function, an automatic rain sensor operation display function, telephone dial information display function, highway status information display function, blind spot indicator display function, or the like. Such displays may be an alpha-numeric display or a multipixel display, and may be fixed or scrolling. In addition, the display element may comprise a television screen and/or video screen. For example, display element 130 (FIG. 10) may comprise a generally planar element or may comprise a convex element. Alternately, display element 130 may be separately formed and include tabs or receiving structures on either side adapted to fit within receiving structures or tabs, respectively, formed in the inside surfaces of casing 112 for assembly after molding of casing 112.

Detail Description Paragraph (50):
[0082] It is also possible to incorporate low level console or instrumentation lighting for vehicles in assembly 16 by fitting a low level non-incandescent light emitting light source such as a light emitting diode for illuminating an instrument panel or console as disclosed in commonly assigned U.S. Pat. No. 5,671,996, the disclosure of which is hereby incorporated by reference. A variety of emitting sources may be used such as high intensity amber and reddish orange light emitting diode sources, such as solid state light emitting diode LED sources utilizing double hydro junction AIGaAs/GaAs Material Technology such as very high intensity red LED lamps (5 mm) HLMP-4100/4101 available from Hewlett Packard Corporation of Pallo Alto, Calif., or transparent substrate aluminum indium gallium phosphide (AlInGaP) Material Technology, commercially available from Hewlett Packard Corporation, of Pallo Alto, Calif. Also, blue or white LEDs can be used or a combination of individual different colored diodes such of red, blue, white, green, amber, orange etc can be used with color mixing thereof to form a desired color or to deliver a desired local intensity of illumination. White emitting light-emitting diodes are available from Nichia Chemical Industries of Tokyo, Japan and from Cree Research Inc., of Durham, N.C. For example, a white light emitting diode is available from Nichia Chemical Industries of Tokyo, Japan under Model Nos. NSPW 300AS, NSPW 500S, NSPW 310AS, NSPW 315AS, NSPW 510S, NSPW 515S and NSPW WF50S, such as is disclosed in U.S. patent application Ser. No. 09/448,700, entitled "Rearview Mirror Assembly With Added Feature Modular Display"

to Timothy G. Skiver et al of Donnelly Corporation, filed Nov. 24, 1999, and in U.S. patent application Ser. No: 09/244,726 entitled "Rearview Mirror Assembly Incorporating Vehicle Information Display" to Jonathan E. DeLine et al of Donnelly Corporation, filed Feb. 5, 1999, the entire disclosures of which are hereby incorporated by reference herein. A variety of constructions are used including GaAsP on GaP substrate, gallium aluminum phosphide, indium galium nitride, and GaN on a SiC substrate. Optionally, a plurality of LEDs such as a cluster of two, three, four, six, eight or the like LEDs (each of the same color or the cluster comprising different colored LEDs) can be used to target and illuminate a local area for higher illumination at that area, such as may be useful in a map light or as reading light or as an interior light or as an illumination source for an interior vehicle cabin-mounted and monitoring camera (most preferably illuminating the target area with white light). Such a cluster of high efficiency LEDs can be mounted as part of mirror assembly 16 (such as in the bottom wall of casing 16b or in a pod attached to or part of one of arm 16c or button 16a) so as to project an intense pattern of light generally downwardly into to vehicle cabin for purposes of map reading, general illumination, courtesy illumination and the like. Also, a cluster of LED's, preferably including at least one white emitting LED and/or at least one blue emitting LED, can be mounted in a roof portion, side portion or any other portion of the vehicle cabin to furnish dome lighting, rail lighting, compartment lighting and the like. Use of white emitting LEDs is disclosed in U.S. patent application Ser. No: _____ (attorney docket 61366) entitled "Lighting Device For Motor Vehicles" to Peter Fuerst and Harald Buchalla of Donnelly Hohe Gmbh & Co, KG, filed Feb. 12 1999, the entire disclosure of which is hereby incorporated by reference herein.

Detail Description Paragraph (55):
[0087] Optionally, and as disclosed in U.S. patent application Ser. No. 09/449,121, filed Nov. 24, 1999, disclosed and referenced above, interior rearview mirror assembly 16 may comprise accessories that can be docked to the assembly for purpose of storage, battery charging, electrical powering, data input and/or output, and similar functions. Such dockable features are detachable by a user of the vehicle from the mirror assembly 16, and are optionally removable from the vehicle for use outside the vehicle. For example, a dockable feature may comprise a light assembly, such as a flashlight assembly, or may comprise a cellular phone, a phone module, pager, INTERNET connector, or the like. In the case of docking a telecommunication device such as a phone or a pager, mirror assembly 16 is preferably adapted to connect to the telecommunication device such as a phone in a manner such that the vehicle control system will recognize the phone and, optionally, direct incoming phone calls to speakers, which may be located in the mirror assembly or elsewhere in the vehicle. In this manner, the dockable phone may provide removable hands-free phone function. Furthermore, in one form, the phone may automatically be activated by the occupant's voice or a switch or by the docking of the phone onto the mirror assembly. In this manner, the phone may be removed when the occupant exits the car for normal remote use or may be docked for hands-free use.

Detail Description Paragraph (56):
[0088] Preferably, the interior rearview mirror assembly 16 includes a power source, such as a recharger, such as in housing 16b, that recharges the battery or batteries in any dockable accessory, which is stored or attached thereto. As previously noted, such dockable accessories can include pagers, cellular phones, flash lights or the like. In this manner, the dockable accessory can be docked for recharging. In the case of the light assembly, the light assembly can be docked for use as a map reading light or the like. When undocked, the light assembly (which includes internal batteries) may be used as a flashlight, as previously noted.

Detail Description Paragraph (59):
[0091] In addition, when either the phone or phone module is docked, as cell phone calls become traceable through a global positioning system (GPS), emergency phone calls may be forwarded or routed to the correct emergency agency for that location. Since each phone has a unique identifier, GPS can identify a phone and, further, identify the location of that phone. For example, the phone or mirror assembly may include a separate emergency button which can be activated by an occupant of the vehicle to notify local emergency agencies that an occupant of the vehicle is in need for emergency assistance. For example, tracing of the phone may be incorporated into or used in conjunction with a vehicle navigation system, such as described in

copending provisional application Ser. No. 60/131,593, filed Apr. 29, 1999, entitled "VEHICLE-BASED NAVIGATION SYSTEM WITH SMART MAP FILTERING, PORTABLE UNIT HOME-BASE REGISTRATION AND MULTIPLE NAVIGATION SYSTEM PREFERENTIAL USE", which is herein incorporated by reference in its entirety. Where the vehicle is equipped with a GPS system, the GPS system can monitor the movement of the vehicle, and by knowing that the vehicle has moved from one location to another, and because the GPS knows the geographic position of both locations relative to each other, the navigation system can determine the directional heading of the vehicle, and furnish this as a compass heading signal for display as a compass display such as at the interior mirror assembly.

Detail Description Paragraph (60):
[0092] A variety of electrical and electronic features can be incorporated into the rearview mirror assembly, such as those disclosed in U.S. patent application Ser. No. 09/433,467, filed Nov. 4, 1999, entitled "VEHICLE INTERIOR MIRROR ASSEMBLY" to Patrick Heslin and Niall R. Lynam, commonly assigned to Donnelly Corporation, which is herein incorporated by reference in its entirety. For example, a microphone or a plurality of microphones may be incorporated, preferably to provide hands-free input to a wireless telecommunication system such as the ONSTAR.TM. system in use in General Motors vehicles. Most preferably such microphones provide input to an audio system that transmits and communicates wirelessly with a remote transceiver, preferably in voice recognition mode. Such systems are described in United States patent application Ser. No. 09/382,720, filed Aug. 25, 1999, the disclosure of which is hereby incorporated by reference herein.

Detail Description Paragraph (61):
[0093] In this regard it may be desirable to use audio processing techniques such as digital sound processing to ensure that vocal inputs to the vehicular audio system are clearly distinguished from cabin ambient noise such as from wind noise, rain noise, climatic noise, road noise, engine noise, traffic noise, HVAC noise, and the like. Digital sound processing techniques, as known in the acoustics arts and such as are disclosed in U.S. Pat. No. 4,959,865 entitled "A METHOD FOR INDICATING THE PRESENCE OF SPEECH IN AN AUDIO SIGNAL", issued Sep. 25, 1990, to Stettiner et al. (the disclosure of which incorporated by reference herein), are particularly useful to enhance clarity of vocal signal detection when a single microphone is used, located in the interior mirror assembly 16 such as in casing 16b, as part of a vehicular wireless communication system such as General Motors' ONSTAR.TM. system. Use of digital signal processing and a single mirror-mounted microphone (such as is described in U.S. patent application Ser. No. 09/396,179, filed Sep. 14,1999, entitled "INDICATOR FOR VEHICLE ACCESSORY", the disclosure of which is incorporated by reference herein) is particularly advantageous for economical achievement of clear and error-free transmission from the vehicle, while operating along a highway, to a remote receiver, particularly in speech-recognition mode. Although advantageous with a single-element mirror mounted microphone (or for a microphone mounted elsewhere in the vehicle cabin such as in the header region), digital sound processing is also beneficial when multiple microphones are used. For example a first microphone, mounted in the mirror casing 16b, can be directed principally towards the mouth of the driver and a second microphone can be directed so as to detect vehicular ambient noise such from HVAC, windshield vibration etc. A signal indicative of the ambient noise can be generated by processing the output of the second microphone, and this signal can be subtracted from a signal generated by processing the output of the first microphone to form a signal substantially representative of the speech picked up by the first microphone. Techniques and circuitry to achieve such speech enhancement are known in the acoustics art, such as are disclosed in U.S. Pat. No. 5,381,473, issued Jan. 10, 1995, entitled "NOISE CANCELLATION APPARATUS" to D. Andrea, the disclosure of which is hereby incorporated by reference herein. Also, noise cancellation techniques such as destructive interference can advantageously be used, whereby the signal as picked up by the microphone is processed, the human vocal signal is distinguished from the noise signal, and whereby the noise signal is fed back 180 degrees out of phase with itself in order to cancel out the noise by destructive interference and so enhance the vocal signal to background noise ratio. Digital sound processing is preferably accomplished using a microprocessor. A variety of microprocessors can be used such as a single-chip microcomputer optimized for digital signal processing and high speed numeric processing such as the ADSP-218x digital signal processors such as the ADSP-2186 single-chip microcomputer, which integrates 40 kilobytes of on-chip memory (including

8K words (24-bit) of program RAM and 8K words (16-bit) of data RAM) along with serial ports, DMA ports, timers, I/O lines, and interrupt capabilities. The ADSP-2186 microcomputer and the ADSP-218x digital signal processors are available from Analog Devices, Inc., Norwood, Mass., and operate with a 16-bit architecture at a computational speed in the 28 to 75 MIPS/MHz range. Also, a digital signal processor that comprises a microcomputer (comprising a microprocessor central computing processor, memory, input/output ports, timers etc packaged on a single chip) is available from Texas Instruments Inc. of Dallas, Tex. under the tradename TMS320LC203 digital signal processor. The TMS320LC203 digital signal processor executes at 20 MIPS (millions of instructions per second) and operates at 40 Mhz. The TMS320LC203 digital signal processor has 2 serial ports, 1 timer, 544 words of RAM and a processor cycle time of 50 nanoseconds. In general, the choice of which digital signal processor to use is influenced by its performance (as indicated by its MIPS rating) and its cost. Since automotive applications are cost sensitive, currently commercially available digital signal processors with a MIPS performance rating in the 1 to 10 range are economical. For the noise cancellation needs in an automobile, it is preferred that the digital signal processor used in the digital sound processing system have a MIPS performance of at least 1 MIPS; more preferably at least 5 MIPS; most preferably at least 10 MIPS. Future improvements in microcomputer design and construction promise to provide economical digital sound processors with a MIPS rating of at least 100 MIPS. In a vehicle wireless communication system installed in a vehicular cabin, location of the microphone(s) in the interior mirror assembly (such as in casing 16b) is advantageous. For digital sound processing of the sound signal detected by the mirror-mounted microphone, an analog to digital converter can be also located at the interior rearview mirror assembly (such as in casing 16b) that converts the analog microphone sensor output to digital form. The microprocessor for performing the digital sound processing algorithms and analysis can also be located at the interior rearview mirror location (such as in casing 16b). Altemately, the microprocessor performing the digital sound processing analysis can be located elsewhere in the vehicle cabin (such as in the vehicle dash, preferably sharing circuitry with other functions of the vehicle wireless communication system), and with the digitized output signal from the AID converter linked to the mirror-mounted microphone being fed to the microprocessor via a wire link or via a car area network (a.k.a. controlled area network) or via a vehicular local area netvork or via an in-cabin, short-range radio transmission network such as via the BLUETOOTH system described below.

Detail Description Paragraph (64):
[0096] Preferably the microphone interfaces to an audio system that includes an analog to digital converter and/or a digital to analog converter for the purpose of converting the analog output of the microphone to a digital signal for input to a digital sound processor and for conversion of the digital output of a digital sound processor to an analog signal for wireless transmission to a remote transceiver. Digital sound processing techniques may be used to enhance the vocal signal to background noise discrimination ratio. Also, both analog and digital audio filtering techniques can be used to enhance the vocal to background noise ratio, and so assist clarity of transmission and/or receipt at a remote receiver and so improve accuracy in voice recognition mode. Preferably, digital filtering is used. Also, physical techniques such as sound insulation, acoustic wave guides, angling of microphones to selectively detect speech versus background noise, use of a directed microphone directed to a potential human speaker in conjunction with a more omnidirectional microphone/sensor microphone intended to detect background noise can be used. Techniques useful to enhance vocal to noise signal ratio include use of analog and/or digital low-pass filtering to limit examination of signal content to, for example, less than 1000 Hz. or less than 750 Hz. (and so help distinguish vocal signal from noise signals), include use of syllabic rate filtering such as is described in U.S. Pat. No. 4,484,344, include use of a hangover time function such as disclosed in U.S. Pat. No. 4,187,396, include use of a digital sound switch and dual threshold detection such as disclosed in U.S. Pat. No. 4,052,568 and include noise canceling microphones and techniques such as disclosed in U.S. Pat. No. 5,909,495 (the disclosures of the above cited U.S. patents are incorporated by reference herein). The vehicular microphone can be voice-activated such as by a digital voice operated switch such as is disclosed in U.S. Pat. No. 5,251,263, the disclosure of which is incorporated by reference herein. An adaptive signal processing system can be used to enhance vocal to noise ratio. Adaptive noise cancellation techniques can be used to produce a speech indication signal in response to detection of voice information in the presence of

background vehicular noise such as are described in "Adaptive Noise Canceling: Principles and Applications" Proc. IEEE, vol. 63, pp. 1692-1716, Dec 1975 by B. Widrow et al., and "Adaptive Noise Canceling for Speech Signals", IEEE Trans. Acoust. Speech and Sig. Proc., vol. ASSP-26, No. 5, October 1978, by M. Sambur, and U.S. Pat. No. 5,033,082 entitled "COMMUNICATION SYSTEM WITH ACTIVE NOISE CANCELLATION", issued Jul. 16, 1999, to Eriksson et al, and U.S. Pat. No. 5,251,263 entitled "ADAPTIVE NOISE CANCELLATION AND SPEECH ENHANCEMENT SYSTEM AND APPARATUS THEREOF", issued Oct. 5, 1993, to Andrea et al, the disclosures of which are hereby incorporated herein in their entirety. Mechanical cancellation of ambient noise can be provided, as can a noise canceling pressure gradient microphone, preferably in conjunction with acoustic ports including voice and noise ports. Such a system is disclosed in World Patent publication WO 9817046 A1 to D. Andrea, published Apr. 23, 1998, and entitled "NOISE CANCELING ACOUSTICAL IMPROVEMENT TO WIRELESS TELEPHONE OR CELLULAR PHONE", the disclosure of which is hereby incorporated by reference. A pressure gradient microphone, as known in the acoustic arts, can be used to reduce the background vehicular noise as detected by a vehicular mirror-mounted microphone, or alternatively, an acoustic feedback system, preferably including compensation filters, can be used. Also, closed-loop active noise reduction techniques and other noise reduction techniques can be used such as disclosed in U.S. Pat. Nos. 2,972,018; 3,098,121; 4,833,719; 4,878,188; 4,977,600; and 5,138,664, and in Japanese Patent Abstract No. 3-169199, the disclosures of which are incorporated by reference herein. An adaptive noise cancellation and speech enhancement system and apparatus suitable for use in a vehicle with a mirror-mounted microphone is disclosed in U.S. Pat. No. 5,251,263, the disclosure of which is incorporated by reference herein. This adaptive noise cancellation system is particularly beneficial when multiple vehicular microphones are used. Other noise cancellation techniques useful for vehicular microphones, and particularly for mirror-mounted microphones that provide input to wireless communication systems, particularly in voice-recognition mode, are disclosed in U.S. Pat. Nos. 5,732,143; 5,825,897; and 5,673,325, the disclosures of which are incorporated by reference herein.

Detail Description Paragraph (65):
[0097] Also, an indicator such as disclosed in U.S. patent application Ser. No. 09/396,179, filed Sep. 14, 1999, entitled "INDICATOR FOR VEHICLE ACCESSORY", the disclosure of which is incorporated by reference herein, can be incorporated into the interior mirror assembly that indicates to the driver and/or passengers that speech being detected by a mirror-mounted microphone (or a microphone located elsewhere in the vehicle cabin such as in a header console) is being transmitted and received clearly and error-free by a remote wireless receiver such as an ONSTAR.TM. operator or a voice recognition system such as is common when calling airlines, services and the like. For example, the signal as wirelessly transmitted from the audio system in the vehicle to the remote receiver may be echoed or retransmitted back to the vehicle where, upon receipt of the retransmitted signal at the vehicle, an in-vehicle voice recognition system interprets the as-received retransmitted signal and either speaks the words/numbers interpreted to the driver for confirmation, or displays the message as received in the vehicle after retransmission so the driver/passenger receives an audible and/or visual indication of what the remote voice recognition transcriber is receiving. If the in-vehicle voice recognition system/in-vehicle indicator is not indicating the expected message, then the driver/passenger will know that the original transmission to the remote voice recognition system was not clear and contained error, and take appropriate action such as repeating the message. By retransmitting back to the vehicle, and confirming in-vehicle, the vehicle occupants can be assured that wireless transmission to the like of a voice recognition system is clear and errorfree.

Detail Description Paragraph (67):
[0099] For example, the interior rearview mirror assembly may include a display of the speed limit applicable to the location where the vehicle is travelling. Conventionally, speed limits are posted as a fixed limit (for example, 45 MPH) that is read by the vehicle driver upon passing a sign. As an improvement to this, an information display (preferably an alphanumerical display and more preferably, a reconfigurable display) can be provided within the vehicle cabin, readable by the driver, that displays the speed limit at whatever location on the road/highway the vehicle actually is at any moment. For example, existing speed limit signs could be enhanced to include a transmitter that broadcasts a local speed limit signal, such

signal being received by an in-vehicle receiver and displayed to the driver. The speed limit signal can be transmitted by a variety of wireless transmission methods, such as radio transmission, and such systems can benefit from wireless transmission protocols and standards, such as the BLUETOOTH low-cost, low-power radio based cable replacement or wireless link based on short-range radio-based technology. BLUETOOTH enables creation of a short-range (typically 30 feet or so although longer and shorter ranges are possible), wireless personal area network via small radio transmitters built into various devices. For example, transmission can be on a 2.45 gigahertz band, moving data at about 721 kilobits per second, or faster. BLUETOOTH, and similar systems, allow creation of an in-vehicle area network. Conventionally, features and accessories in the vehicle or wired together. Thus, for example, an interior electrochromic mirror and an exterior electrochromic mirror is connected by at least one wire in order to transmit control signal and the like. With BLUETOOTH and similar systems, control commands can be broadcast between the interior mirror and the exterior mirror (and vice versa) without the need for physical wiring interconnecting the two. Likewise, the two exterior mirror assemblies on the vehicle can exchange, transmit and/or receive control commands/signals (such as of memory position or the like such as is described in U.S. Pat. No. 5,798,575, the disclosure of which is hereby incorporated by reference herein) via an in-vehicle short-range radio local network such as BLUETOOTH. Similarly, tire pressure sensors in the wheels can transmit via BLUETOOTH to a receiver in the vehicle cabin such as in the interior mirror assembly, and tire pressure status can be displayed, preferably at the interior rearview mirror. In the case of the dynamic speed limit system described above, preferably, the in-vehicle receiver is located at and/or the display of local speed limit is displayed at the interior mirror assembly (for example, a speed limit display can be located in a chin or eyebrow portion of the mirror case, such as in the mirror reflector itself, such as in the module 10, or such as in a pod attached to the interior mirror assembly). More preferably, the actual speed of the vehicle can be displayed simultaneously with and beside the local speed limit in-vehicle display and/or the difference or excess thereto can be displayed. Optionally, the wireless-based speed limit transmission system can actually control the speed at which a subject vehicle travels in a certain location (such as by controlling an engine governor or the like). Thus, a school zone speed limit can be enforced by transmission of a speed-limiting signal into the vehicle. Likewise, different classes of vehicles can be set for different speed limits for the same stretch of highway. The system may also require driver identification and then set individual speed limits for individual drivers reflecting their skill level, age, driving record and the like. Moreover, a global positioning system (GPS) can be used to locate a specific vehicle, calculate its velocity on the highway, verify what the allowed speed limit is at that specific moment on that specific stretch of highway, transmit that specific speed limit to the vehicle for display (preferably at the interior rearview mirror that the driver constantly looks at as part of the driving task) and optionally alert the driver or retard the driver's ability to exceed the speed limit as deemed appropriate. A short-range, local communication system such as envisaged in the BLUETOOTH protocol finds broad utility in vehicular applications, and particularly where information is to be displayed at the interior mirror assembly, or where a microphone or user-interface (such as buttons to connect/interact with a remote wireless receiver) is to be located at the interior (or exterior) rearview mirror assembly. For example, a train approaching a railway crossing may transmit a wireless signal such as a radio signal (using the BLUETOOTH protocol or another protocol) and that signal may be received by and/or displayed at the interior rearview mirror assembly (or the exterior sideview mirror assembly). Also, the interior rearview mirror and/or the exterior side view mirrors can function as transceivers/display locations/interface locations for intelligent vehicle highway systems, using protocols such as the BLUETOOTH protocol. Protocols such as BLUETOOTH, as known in the telecommunications art, can facilitate voice/data, voice over data, digital and analogue communication and vehicle/external wireless connectivity, preferably using the interior and/or exterior mirror assemblies as transceiver/display/user-interaction sites. Electronic accessories to achieve the above can be accommodated in casing 16b, and/or elsewhere in the interior mirror assembly (such as in the housing disclosed in U.S. patent application Ser. No. 09/433,467, filed Nov. 4, 1999, entitled "VEHICLE INTERIOR MIRROR ASSEMBLY" to Patrick Heslin and Niall R. Lynam.

Detail Description Paragraph (68):
[0100] Providing a docking capability and/or storage space for the like of a cellular

phone has several advantages, especially when used in conjunction with an in-vehicle microphone and ONSTAR.TM. or similar vehicular wireless communication system. In such a system, the vehicle typically comes equipped from the original equipment manufacturer (typically an automaker such as General Motors, Ford or the like) with an excellent radio/CD/tape audio system with good speakers, amplifiers, graphic equalizers etc. Coupled with a high quality microphone, the quality and power of the vehicular audio system typically exceeds that found in a hand-held cellular phone. Also, when the vehicle is equipped with an ONSTAR.TM. system, the vehicle is typically already provided with a quality wireless transmitting/receiving antenna, and often with a GPS system as well. Thus, providing a docking function (preferably at the interior rearview mirror but at other location such as the header console or the like is contemplated) has advantages beyond providing a recharging power source to the personal hand-held phone (or pager or the like). Once docked (which encompasses linking the portable unit to the interior mirror assembly via a cable or via a cable-less connection such as by a remote IR link), the driver and/or passengers can optionally and preferably make and receive telephone calls via their docked personal phone, but with the audio system being provided by the in-vehicle, pre-existing, speakers, amplifiers, microphone etc. Preferably, whenever a phone call is initiated, any radio station or other music or play though the vehicle audio system is turned off for the duration of the phone call. Also, the ringing tone indicating a call is being received at the docked personal phone preferably sounds through the car audio system so that it is audible even if the car audio is playing music or the like. In this manner, the driver and/or passenger can be contacted via their personal cellular phone number while driving on the highway. As regulations increase forbidding the use cellular phones while driving, unless hands-free, use of the existing vehicle audio system to make and receive calls is advantageous as quality of sound is enhanced thereby. The present invention contemplates a personal cellular phone having a detachable module that includes the circuitry that makes that phone specific and unique in terms of caller identifier. Thus, when the driver, for example, enters the vehicle, he/she detaches the identifier module from the personal mobile hand-held cellular phone and plugs it to a receiving portion of the in-vehicle wireless transmission system (that may comprise an antenna, speakers, an amplifier, a microphone, a keypad etc). Once the identifier module is plugged into the vehicular wireless communication system, the vehicle wireless communication system now emulates the hand-held personal phone, allowing calls be made or received at the personal phone number of the owner of the personal cellular phone. All such in-vehicle communication can be in voice-recognition mode, or a keypad can be provided for the driver to key in a phone number. Although illustrated here for a cellular phone, these concepts have broad application to like of hand-held computers and the like. Also, soon all cellular phone calls will be traceable as to the geographic location of the call. Thus, by making a call from the vehicle, the location of the vehicle is traceable by the likes of the phone service provider such as MCI, SPRINT and the like. Thus, the geographic location of the vehicle can be identified by the driver placing a call. A user-operated "SOS" button can be provided in the vehicle such that, when activated, a cellular phone call is initiated, this call is directed to the cellular phone company, the cellular phone company identifies the vehicle's location, and the cellular service provider, once the vehicle's location is identified, automatically connects the phone to the emergency "911" service particular to the location of the vehicle. Thus, no matter where the call is made from, the driver of the vehicle is automatically connected to the emergency services.

Detail Description Paragraph (73):
[0105] For example, casing 16b may contain a sensor or sensors for vehicle altitude and/or incline, seat occupancy or air bag activation enable/disable, or (if a viewing aperture is made in the housing 16b) photosensors for headlamp intensity/daylight intensity measurement. Alternatively, housing 16b may contain a transmitter and/or receiver, along with any associated sensors, for geographic positioning satellite (GPS) systems, pagers, cellular phone systems, ONSTAR.TM. wireless communication, systems, vehicle speed governors, security systems, tire monitoring systems, remote fueling systems where vehicle fueling and/or payment/charging for fuel is remotely achieved, remote keyless entry systems, garage and/or security door opener systems, INTERNET interfaces, vehicle tracking systems, remote car door unlock systems, e-mail systems, toll booth interactions systems, highway information systems, traffic warning systems, home access systems, garage door openers and the like. Of course, any of the above may be mounted elsewhere in mirror assembly 16.

Detail Description Paragraph (75):
[0107] Most preferably such microphones provide input to an audio system that transmits and communicates wirelessly with a remote transceiver, preferably in voice recognition mode. Such systems are described in commonly assigned, U.S. patent application Ser. No. 09/382,720, filed Aug. 25, 1999, the disclosure of which is hereby incorporated by reference herein.

Detail Description Paragraph (79):
[0111] Restricted-range wireless communication systems such as BLUETOOTH, as known in the telecommunications art, can facilitate voice/data, voice over data, digital and analog communication and vehicle/external wireless connectivity, preferably using the interior and/or exterior mirror assemblies as transceiver/display/user-interaction sites. Electronic accessories to achieve the above can be accommodated in housing 16b, and/or elsewhere in the interior mirror assembly (such as in the mirror bracket). Examples of such electronic accessories include invehicle computers, personal organizers/palm computers such as the Palm Pilot.TM. personal display accessory (PDA), cellular phones and pagers, remote transaction interfaces/systems such as described in commonly assigned, U.S. patent application Ser. No. 09/057,428, filed Apr. 8, 1999, the disclosure of which is hereby incorporated by reference herein, automatic toll booth payment systems, GPS systems, e-mail receivers/displays, a videophone, vehicle security systems, digital radio station transmission to the vehicle by wireless communication as an alternate to having an in-vehicle dedicated conventional radio receiver, traffic/weather broadcast to the vehicle, preferably digitally, and audio play and/or video display thereof in the vehicle, most preferably at the interior rearview mirror, highway hazard warning systems and the like.

Detail Description Paragraph (83):
[0115] Preferably, interior rearview mirror assembly 16 includes at least one microphone coupled with a digital sound processor, most preferably supplied as a module comprising at least one microphone that provides an output to a microprocessor-based control that performs digital sound processing on the microphone output in order to enhance the human vocal signal received and in order to reduce any non-vocal signal components from ambient noise in the vehicle cabin. A preferred rearview mirror digital sound processing system 250 comprises, as shown in FIG. 11, a microphone 255 that detects sounds within the interior of the vehicle in which the interior mirror incorporating digital sound processing system 250 is mounted. Preferably, microphone 255 of digital sound processing system 250 is mounted in mirror housing 16b of mirror assembly 16 (although other locations such as within module 10 or elsewhere on mirror assembly 16 such as at the mirror button mount that mounts to mirror button 1 6a may be used, depending on the particular model of vehicle involved. Likewise, mounting microphone 255 at, on or in the headliner 14 or as part of a trim item or header console associated with header 14 may also be desirable, depending on the configuration of a particular vehicle). Optionally and preferably, microphone 255 has its zone of sensitivity directed to the expected location in the front of the cabin of the vehicle where a driver's mouth and/or a front-seat passenger's mouth can be expected to be located so as to enhance microphone pick-up of spoken vocal inputs over background noise. Optionally, microphone 255 comprises a single-element, pressure-gradient microphone. Also, and preferably, microphone 255 is acoustically protected from background cabin noise by use of a passive sound insulator 260, as is known in the acoustic arts, and/or by using noise cancelling techniques such as a pressure gradient such as used in a pressure gradient microphone and/or by use of a microphone isolator and/or by use of acoustic baffles . The analog sound output signal 265 of microphone 255 is optionally filtered by analog filter 270 that has a high bandpass for vocal sound frequencies such as less than about 1000 Hertz and that has reduced transmission and/or is blocking to audio frequencies outside the vocal range. The output 275 of analog filter 270 is input to analog to digital (A/D) converter 290 where it is converted from an analog signal to a digital signal 295. Digital signal 295 is processed by digital sound processor 300 where, using digital sound processing techniques as known in the acoustics art and as disclosed and referenced above, the vocal component of digital signal 295 is distinguished from the non-vocal components of digital signal 295 to form a digital vocal signature signal 310 that is output from digital sound processor 300. Preferably, digital sound processor 300 comprises a microprocessor with associated digital memory storage, and most preferably comprises a digital signal processor such as a single-chip microcomputer optimized for digital

signal processing and high speed numeric processing such as the ADSP-218x digital signal processors such as the ADSP-2186 single-chip microcomputer, which integrates 40 kilobytes of on-chip memory (including 8K words (24-bit) of program RAiM and 8K words (16-bit) of data RAM) along with serial ports, DMA ports, timers, I/O lines, and interrupt capabilities. The ADSP-2186 microcomputer and the ADSP-218x digital signal processors are available from Analog Devices, Inc., Norwood, Mass. It is preferred to use a digital signal processor that comprises a computer-on-a-chip (which is capable of extensive and rapid mathematical/computational processing) as part of the digital sound processor of the current invention as such digital signal processors provide a compact, high-performing and economical microcomputer for utilization in the digital sound processing system accommodated such as in housing 16b of mirror assembly 16. Use of a digital signal processor comprising a fast computational microcomputer as a component of digital sound processing system 250 is particularly preferable when system 250 is operating in voice recognition, vocal verification and/or voice activation mode. Digital vocal signature signal 310 exhibits an increased vocal signal to non-vocal noise signal ratio compared to the vocal signal to non-vocal noise signal ratio of signal 265 output by microphone 255. Vocal signature signal 310 is input to digital to analog (D/A) converter 320 where it is converted to analog vocal signature signal 325. Analog vocal signature signal 325, that has an enhanced vocal to non-vocal signal ratio, is provided as an input to audio signal processor 330. Audio vehicle signal processor 330 is preferably a telecommunication (sometime referred to as a telematic) device comprising a transmitter and receiver in two-way wireless communication (such as by radio frequency communication) with a person and/or device external to and remote from the vehicle in which rearview mirror digital sound processing system 250 is installed (such as within mirror housing 16b or within module 10 of mirror assembly 16). Alternately (or in addition), audio vehicle signal processor 330 can be a voice activated controller for a vehicle function [such as a vehicular radio, entertainment system, climate control system such as a HVAC (heating, ventilation and/or air conditioning) system, seat position and seat configuration controller, mirror reflector positioning system, invehicle computer system, dictation and/or messaging system, pager system, cellular phone system, door lock/unlock system, cruise control system, gear change system, headlamp activation/deactivation system, navigation system such as a GPS system, turn signal activation/deactivation system, vehicle ignition system, vehicle security system, sun roof open/close system, vehicle window open/close system, vehicle suspension system adjustment system, vehicle camera system and other similar vehicular functions whose operation is controlled by voice command]. By using rearview mirror digital sound processing system 250, vocal commands and inputs as received at audio vehicle signal processor 330 are substantially free of noise and interference, thus facilitating clarity and accuracy of the voice input to the like of an ONSTAR.TM. wireless telecommunication system or a voice-activated vehicle accessory such as a vehicular CD or DVD audio entertainment system or an in-vehicle INTERNET interface connected to the worldwide web (such as to access e-mails). Optionally, rearview mirror digital sound processing system 250 may include a voice recognition system that can learn a person's voice signature. For example, digital sound processor 300 may include a voice learn mode whereby, for example, a driver may input his/her voice signature so that digital sound processor 300 preferentially and/or uniquely reacts to that particular voice pattern. Such a voice recognition capability has advantages in a security system (for example the vehicle ignition may be disabled unless rearview mirror digital sound processing system 250 recognizes a voice input from an authorized user, or a cellular phone can remain inoperable unless rearview mirror digital sound processing system 250 recognizes a voice input from an authorized user). Optionally, digital sound processor 300 may store the voice signatures of a variety of authorized users (such as of several members of a family, or employees of a company) so as to allow access to vehicle functions to a restricted group of individuals. Once digital sound processor 300 recognizes a particular authorized user in the vehicle, optionally, a variety of vehicle functions (such as seat position and/or seat configuration, position of the mirror reflector at the interior and/or sideview mirrors and the like) can be set to the predetermined preference setting for that particular individual. Also, digital sound processor 300 may include a leaming capability whereby digital sound processor 300 learns from voice recognition events and/or errors experienced during operation of rearview mirror digital sound processing system 250 in the vehicle. Thus, rearview mirror digital sound processing system 250 learns from past voice input/command recognition errors, practices and/or experiences so that rearview mirror digital sound processing system 250 becomes expert over time in recognizing the speech pattern,

accent, diction, idioms and dictionary (including unusual words) of individual repetitive users of rearview mirror digital sound processing system 250.

Detail Description Paragraph (85):
[0117] Preferably, all the components of rearview mirror digital sound processing system 250 are located at, on or in interior rearview mirror assembly 16 such as within mirror housing 16b. This allows a mirror manufacturer supply a rearview mirror digital sound processing system including a mirror assembly, microphone(s) and digital sound processor as a unified system to an automaker who can then mount the mirror-mounted rearview mirror digital sound processing system onto the vehicle as the vehicle is being assembled on an assembly line at an automobile assembly plant. Most preferably, audio vehicle signal processor 330 (along with any antennae for transmitting and/or receiving wireless signals to and from the vehicle) is also included in mirror assembly 16 (such as in housing 16b) so that that the interior mirror assembly can be supplied to an automaker complete with the microphone, digital sound processor and audio system that receives and acts on the vocal signature signal output by the digital signal processor. Preferably, all components of digital sound processing system 250 can be accommodated in mirror assembly 16, and be shipped to the automaker as a unitary assembly. In this was, a complete wireless telecommunication system [that accomplishes the functions such as achieved by the General Motors (of Detroit, Mich.) ONSTAR.TM. system or the Ford Motor Company (of Detroit, Mich.) RESCU.TM. system including operator assisted service and operation in voice recognition mode] can be included as part of interior rearview mirror assembly 16.

Detail Description Paragraph (88):
[0120] Digital sound processing system 250 optionally includes an indicator 340 (such as described above) that indicates to the driver when voice inputs from the driver (or from any other vehicle occupant) are being clearly and accurately received and processed. Thus, for example, digital sound processor 300 can analyze the quality of digital signal 295 and/or digital vocal signature signal 310 and determine whether the vocal quality of the signal is adequate for low-error or no-error voice recognition. If the signal quality is adequate for voice recognition, indicator 340 can signal such to the driver by a variety of means such as by displaying the alphanumeric text of the spoken message on a display readable by the driver (itself preferably displayed at the mirror assembly) so that the driver can view and confirm and accept what the sound processing system is determining to have been spoken. Alternately, indicator 340 can comprise an indicator light (such as a light emitting diode) that illuminates whenever the sound processor determines that adequate vocal sound volume and/or clarity is being received. Preferably, such an indicator is located at interior mirror assembly 16, as viewing the mirror is part and parcel of the driving task. Thus, for example, should the indicator LED flicker and/or extinguish due to poor pick-up of speech input to digital sound processing system 250, the driver would be prompted to speak-up, turn down any noise creating accessory, repeat or take similar corrective action. Where audio vehicle signal processor 330 comprises a wireless telecommunication system such as ONSTAR.TM. in communication with a receiver remote to the vehicle, the remote receiver can optionally determine whether the vocal signal as received by transmission from the vehicle is of sufficient vocal quality to facilitate voice recognition and so accurately transcribe/act on spoken alphanumeric text. The remote receiver can transmit back to the vehicle a status indication of the quality of vocal signal as received from the vehicle; and this status can be indicated by indicator 340.

Detail Description Paragraph (89):
[0121] FIG. 12 describes a vehicular digital sound processing 450 utilizing two microphones 455, 456 that provide signals 460, 461, respectively, as inputs to digital sound processor 470 which provides vocal signature signal 485 to audio vehicle signal processor 490. Microphone 455, when attached to mirror assembly 16, has its zone of audible sensitivity principally directed towards the expected location of the drivers's mouth in the vehicle cabin and thus, signal 460 is enriched in vocal content but also has included noise components from ambient cabin noise. By contrast, microphone 456 is more omni-directional (optionally, microphone 456 is a boom microphone) that has its zone of sensitivity set to detect ambient noise so that signal 461 is enriched in ambient noise content. By receiving separate inputs (and with each individual input optionally filtered to enhance their principal signal content), digital sound processor 470 can mathematically/computationally analyse the respective inputs, and their combination, in order to extract, using noise

cancellation techniques as known in the art, vocal signature signal 485 which is input to audio vehicle signal processor 490 (for example, an ONSTAR.TM. system) where signal 485 is clearly and accurately received and processed, including in voice recognition mode. Use of at least two microphones in vehicular digital sound processing is beneficial to facilitate generation of high quality vocal signals because destructive interference techniques and/or signal averaging techniques can be utilized to cancel out unwanted noise and to isolate the desired vocal signature signal that is indicative of the alphanumeric words spoken by the driver and/or other vehicle occupant. More than two microphones can be used, such as a four microphone system with a microphone directed to pickup speech from a driver, a second microphone directed to pick-up speech from a front-seat passenger, and two further microphones directed to pick-up ambient cabin noise.

Detail Description Paragraph (94):
[0126] Referring to FIG. 16, mirror-mounted digital sound processing system 1000 is mounted in interior rearview mirror housing 1010. Four microphones, 1020, 1022, 1024 and 1026, are positioned to detect sound via apertures in the front, lower bezel portion of housing 1010. The respective analog signal outputs 1030,1032,1034,1036 of microphones 1020, 1022, 1024, 1026 are converted to digital signals 1040, 1042, 1044, 1046 by analog to digital converters 1050, 1052, 1054, 1056. Digital signals 1040, 1042, 1044, 1046, which are indicative of vocal inputs due to speech in the vehicle cabin with vehicle cabin noise superimposed thereon, are input to digital sound processor 1060 which comprises a microcomputer that processes digital signals 1040,1042,1044,1046 and that applies noise cancellation techniques, as disclosed and referenced above, to produce digital vocal signature signal 1070 which has substantially reduced vehicle cabin noise content due to the noise cancellation performed by digital sound processor 1060. Digital vocal signature signal 1070 is provided to digital to analog converter 1075 which provides analog signature signal 1080 (which has substantially reduced vehicle cabin noise content due to the noise cancellation performed by digital sound processor 1060) to vocal signature output connector 1085. Vocal signature connector 1085 is connected to audio system 1090 (that may comprise an ONSTAR.TM. wireless telecommunication system, a cellular phone system, an in-vehicle computer system, a voice-command control system, an INTERNET system or a similar voice-interacting system, most preferably operating in voice recognition mode) in order to provide analog vocal signal 1080 to audio system 1090. Audio system 1090 is located at a distance from the location of interior mirror housing 1010 when mounted in the vehicle cabin (such as in a vehicular dash area or in an instrument panel area or in a roof area such as a roof console area). User actuatable controls 1095 provide a manually selected control signal 1097 to digital sound processor 1060. Indicator 1098 receives a signal 1099 from digital sound processor 1060. Signal 1099 is indicative of the voice recognition accuracy of the vocal signature signal output by digital sound processor 1060.

L14: Entry 68 of 108 File: USPT Mar 25, 2003

DOCUMENT-IDENTIFIER: US 6539080 B1
TITLE: Method and system for providing quick directions

Brief Summary Text (5):
Today, travel directions to a destination location can be obtained in different ways. Internet web sites now provide map routing software that generate and display driving instructions from one starting location to another destination location. The traveler enters the desired starting (from) location and the desired destination (to) location into the software program and has the option to select the fastest, easiest, or shortest distance driving directions to the destination location. The map routing software determines the route to the destination and displays it on the user's display terminal with step-by-step driving directions, estimated travel times, and mileage from the starting location to the ending location. This type of map routing software, however, requires a traveler to plan his trip in advance and have Internet access. It is of little assistance in the situation when a traveler becomes lost during his trip, needs assistance with directions, and does not have ready access to the Internet.

Brief Summary Text (6):
Recently, Global Positioning Satellite ("GPS") navigation systems allow a traveler to track his location in real-time as he travels on the surface of the earth. In-car GPS-guided navigation systems allows an automobile driver to track his current location in real-time and obtain voice and visual directions on how to get from his current location to a destination location. Destination locations can be selected from an in-car terminal by street address, street intersections, or city. These on-board navigation systems also include categorical search tools that allow users to find points of interest such as museums, parks, airports, stores, etc. To reach his destination, the driver is given specific driving instructions from an in-car terminal on how far to proceed and when to turn and exit. These on-board navigation systems, however, are complex and expensive, require a considerable up front investment and a complex installation procedure.

Detailed Description Text (2):
The present embodiment allows telephone callers to place a telephone call to a telephone number to obtain information and assistance in locating selected destination locations and obtain step-by-step driving directions to reach the selected destination locations over the telephone. An illustrative embodiment provides the ability to automatically identify the calling party's calling location without requiring the caller to manually identify his location. The calling location can then be used to map a route to the destination location and determine the proper driving instructions for the caller to arrive at the requested destination location.

Detailed Description Text (3):
In a described embodiment of the invention, telephone callers place a telephone call to access the system and select a desired destination location. The destination location may be selected from a white or yellow pages listing through an automated interactive voice response system or a live human operator. The destination location may be any locations such as a person or individual, or a street address, hotel, stores, restaurant, business office, etc. listed in the white or yellow pages directory.

Detailed Description Text (4):
After selecting the desired destination location, the caller may receive driving route

instructions to the destination location from the system. For example, the caller's location and the desired destination location is sent to a database with application software which can map a route and provide driving instructions from the caller's location to the desired destination location or from another location to the desired destination location. The database and application software maps the driving route and determines step-by-step driving instructions to reach the destination. In a particular embodiment, the route to the destination location can be mapped taking into account the route traffic, travel-times, road conditions, and route weather conditions.

Detailed Description Text (5):
The caller may receive the driving or route instructions in a variety of different ways. The route instructions can be communicated directly over the telephone from an interactive voice response system, a live operator, a synthesized voice, a voice mail message, and Internet electronic mail, an alpha/numeric pager or telephone or a Personal Digital Assistant ("PDA").

Detailed Description Text (7):
FIG. 1 shows a system level diagram of an illustrative embodiment of the present invention. Shown in FIG. 1 are a telephone subscriber or caller 12 accessing the system as a caller seeking assistance, an access or switching network 14 such as the Public Switched Telephone Network ("PSTN") provided by local telephone companies such as Ameritech and long distance carriers such as AT&T and WorldCom/MCI. A switch device 16 such as a DMS-200 from Nortel or an Automatic Call Distributor ("ACD") such as those from the Rockwell Corporation, which provides access to and routes calls through the system. Also shown is an operator console or workstation 18 where a human operator to handle calls may be located, and a database 20, which may include a plurality of databases. In an illustrative example, the database 20 may include a directory listing database 22, a GEO TN database 23, and a routing database 24. Also shown is a gateway 26 interface that receives driving route instructions generated from the routing database 24. The gateway 26 interface translates the text route directions to interface the route directions to the audio box 28. For example, the route instructions may be generated in a text format that the gateway 26 interface translates to a data format appropriate for the audio box 28. The appropriate data format may be a specialized text format that can be forwarded on to the audio box 28. The audio box 28 translates the route instructions into audio speech that can be heard by a caller using speech synthesis. The audio box 28 allows a caller to retrieve directions without the continued interactive assistance of a human operator.

Detailed Description Text (8):
Described below in connection with FIG. 1 is an overview of an illustrative embodiment of the system in operation. A telephone caller or user 12 desiring assistance with a variety of services such as travel directions, maps, weather, traffic travel times, directory assistance white page listings, and road conditions originates a telephone call to a dial-in telephone access number to access the system 13. For example, a landline or a mobile cellular telephone subscriber 12 dials the telephone number of the dial-in access telephone number. The telephone call is routed through the switching network 14 to the dial-in access telephone line terminated to the switch 16. The switching network 14 may include the PSTN as previously described. The dial-in telephone access number is preferably a double digit, 7-digit, 10-digit or toll free telephone number such as an "800" or "888" telephone number. To provide greater call capacity, a high-capacity telephone line, such as a T1 or Primary Rate Interface circuit may be used to implement the access telephone line. Wireless telephone users may be configured to simply dial a "*NNN" to access the system. In a preferred embodiment, the service may be accessed through a basic "411" directory information service. For example, callers may dial 411 to obtain directory information and also be given the option to obtain street driving instructions to the requested directory listing. If driving route directions are desired, the telephone call may be routed to the appropriate operator console to handle obtaining the driving instructions. Alternatively, the system may be setup such that all the 411 operators are trained and equipped to handle the calls requesting driving instructions.

Detailed Description Text (11):
The operator console 18 displays the call details to the operator while the call is being handled. Referring now to FIG. 2, shown is an exemplary display of the operator console 18 while handling a call requesting directions to a destination location. It

should be understood that FIG. 2 is a simplified illustrative drawing and the operator console display can be implemented as a Windows-type interface. At the bottom of the screen, a call detail window 32 can display call information from the call detail record, such as the ANI or location where the caller and the desired ANI where the caller wishes the directions to start. Often the caller's ANI and the desired ANI will be the same. The caller may also, however, request that directions be given from a different location, resulting in a different desired starting location. The address fields and the cross street information can be determined from the ANI and the database information. The station type of the caller may also be displayed, but is not explicitly shown in this example. The operator views the call details and queries the subscriber 12 for his or her request. Preferably, the caller's location is automatically identified and displayed on the operator console 18 as described above. Of course, the operator can request the caller for the starting location to confirm the automatically identified location. The operator can accept the information in the call detail window 32 or make any changes or correction to the information before making the request to the database to map the route.

Detailed Description Text (15):
Referring to FIG. 3, the starting and destination locations are applied to a database 20 to map a route and create step-by-step route driving instructions between the starting location and the selected destination location. Preferably, a map routing software program 21 applies the geo-coordinates of the selected locations to the routing database 24 to determine appropriate routing instructions 25 from the starting geo-coordinate to the ending geo-coordinate as will be described in more detail below. In the illustrative embodiment, the route instructions or driving directions 25 are step-by-step street driving instructions. The route instructions 25 can then be passed to the operator console 18 for the operator to view and relay to the caller. Referring again to FIG. 2, the route instructions can be displayed on the main portion or window 34 displayed on the operator console 18. Preferably, the instructions are demarcated in a step-by-step manner as illustrated in FIG. 2.

Detailed Description Text (24):
Alternatively, ALI of mobile wireless telephone calls may be implemented with a dedicated radio location network using a separate infrastructure and different frequencies than those used by cellular, PCS, paging, mobile satellite or SMR carriers, to determine the location of the caller. A dedicated location network is employed to triangulate the position of the caller though an analysis of RF signals received at different points in the location network. Presently, the primary frequency band used for radio location is known as the location and monitoring services ("LMS") band at 902-928 MHz. An example of an ALI technology using a dedicated radiolocation network is provided by Teletrac, Inc. The Teltrac system is available primarily in major metropolitan areas for fleet management solutions such as automatic vehicle tracking ("AVL") and related assets tracking services. In addition, the most prevalent ALI technology today is Global Positioning Satellite ("GPS") technology. GPS technology uses a network of 24 earth orbiting satellites to track a GPS receiver's location on the earth with an accuracy between 60 and 300 feet. The GPS receiver's location is determined by triangulating a timing and distance measurement between a plurality of the earth orbiting GPS satellites and a GPS receiver on the surface of the earth. GPS location frequencies are provided by U.S. Government at well-known frequencies. Location technology equipment is available from a number of manufacturers such as Rockwell, Trimble or Navtech.

Detailed Description Text (29):
In an illustrative embodiment of the invention, it is contemplated an automated interactive voice response system provided by the audio box 28 allows callers 12 to access the information without requiring a live human operator. Alternatively, a user may access the system using a computing device with a modem and a computer display. Preferably the computing device is a portable computer such as a handheld or pahntop computer which can be used by a caller who is traveling and away from the office. The portable computer may have any suitable interface and display for showing text and preferably even graphics capability for displaying maps. The portable computer may have a Windows CE, Palm OS, Apple Newton or other operating system suitable for a portable computer. Suitable computing platforms include portable devices such as a Palm Pilot, Apple Newton, portable Windows CE machines, or similar portable machines from Psion, Phillips, Hewlett-Packard, and other manufacturers of portable computing

devices. These portable-computing devices can be used to access into the system on a dialup telephone line that can be provided to allow access by a computer terminal. Once accessed to the system, the user can operate the system through a computer interface, without requiring an operator.

Detailed Description Text (30):
After determining the caller's location and identifying the caller's desired destination location, a route between the two locations can be mapped and step-by-step driving directions generated according to the mapped route. The map routing software typically includes a database 20 such as a route information database 24 storing map routing information. The map routing software is applied to the database 20 preferably containing street map or routing information to derive the appropriate route between the locations. The map routing software takes a starting location and a destination location and maps a route between the two locations using the geographic location coordinates of the starting and destination locations. The mapped route can then be used to generate concise step-by-step driving or route instructions from the starting location to the destination location. The total distance of the mapped route and estimated driving time and estimated time of the caller's arrival can also be provided. Preferably, the mapping software converts east, west, north, and south directions into left and right turn instructions. Map routing application software capable of generating driving directions are well known to those of skill in the art. For examples, such software can be found on the Internet at sites such as Mapquest, Expedia, Citysearch, and Mapblast.

Detailed Description Text (31):
In a particular embodiment, the mapping application software can be provided in conjunction with a variety of real-time information such as weather, traffic travel times, and road conditions. For example, local transportation authorities offer real time traffic information on the local highways and interstate roads. These systems typically provide travel times between selected locations as well as the speed of moving traffic at road sensors embedded into the roadway monitoring the speed of moving traffic. Road construction information is also provided by the location of the construction (i.e., "Eastbound I-88 at the Fox River Bridge"), the construction type (i.e., "Road Closure" or "Lane Closure") and the duration of the closure (i.e., "Feb. 20, 1998 08:00 to Feb. 20, 1998 14:00"). An example of this type of information is provided by the Gary-Chicago-Milwaukee ("GCM") Priority Corridor - Illinois Department of Transportation, Indiana Department of Transportation, and Wisconsin Department of Transportation in cooperation with the University of Illinois at Chicago Department of Electrical Engineering and Computer Science. The federal government has provided funding for these types of projects in the IVHS Act of 1991 as part of the Intermodal Surface Transportation Efficiency Act of 1991. Additional information can be found at the GCM web page on the Internet. The traffic/construction information can be used by the system to avoid routes that are closed or are experiencing undue delays due to construction. The system can be programmed to avoid mapping routes through construction routes by creating alternative routes, or recalculating routes not using the sections of road under construction.

Detailed Description Text (32):
The map routing application software generates text route instructions in a format that is human or machine-readable. The text route instructions can then be transmitted to the operator console 18 to allow the operator to view the route instructions. The operator may then relay the route instructions to the caller.

Detailed Description Text (36):
For example, after retrieving the driving directions, the operator console 18 transfers the call to audio box 28. The audio box 28 provides the interactive user interface system to communicate route instructions to the caller 12. Preferably, the interactive user interface provides an interactive voice response system with speech recognition to implement an automated user interface to provide information to callers. The audio box 28 may include an Interactive Voice Response ("IVR") system having speech recognition and speech synthesis capability. Suitable audio speech boxes are available from the Lucent Corporation which can be programmed with the assistance of the descriptions herein.

CLAIMS:

8. The system of claim 1 wherein the automatic location identification identifies the caller location comprising a GPS location system.

9. The system of claim 1 the interactive user interface comprising: a gateway for translating the route instructions to an audio box for speech synthesis; and an audio box for receiving the translated route instructions and verbalizing the route instructions.

10. A system for providing a telephone caller driving instructions from a calling location to a destination location comprising: an automatic location identification for automatically identifying the calling location from where the telephone caller originated the telephone call, comprising: automatic number identification for identifying the calling party telephone number; and a telephone number database for determining the address of the calling party telephone number; a database for mapping route instructions from the calling location to the destination location, wherein the route instructions are coded at demarcated points to allow for manipulation of the route instructions during playback; and an interactive user interface accessible over a telephone call for communicating route instructions to the telephone caller, wherein the interactive user interface provides a user commands at each demarcated point to manipulate, during playing, the playback of the route instructions, comprising: a gateway for translating the route instructions to an audio box for speech synthesis; and an audio box for receiving the translated route instructions and verbalizing the route instructions.

21. A system for providing a telephone caller driving route instructions from a starting location to a destination location comprising: a database for mapping route instructions from the starting location to the destination location, wherein the route instructions are coded at demarcated points to allow for manipulation of the route instructions during playback; an interactive user interface accessible over a telephone call for communicating route instructions to the telephone caller, wherein the interactive user interface provides a user with commands at each demarcation point to manipulate, during playing, the playback of the route instructions; a gateway for translating the route instructions to an audio box for speech synthesis; and an audio box for receiving the translated route instructions and verbalizing the route instructions.

L14: Entry 71 of 108 File: USPT Feb 25, 2003

DOCUMENT-IDENTIFIER: US 6526335 B1
TITLE: Automobile personal computer systems

Brief Summary Text (3):
Automobile personal computers are presently available that allow users to obtain driving directions by supplying a starting address and a destination address. Users may also receive e-mail notifications, stock quotes, and traffic information. An open platform operating system has been used on these automobile personal computers to allow users to install third-party applications that have been designed for the platform.

Brief Summary Text (8):
The automobile personal computer may have various peripheral devices. Information on the location of the automobile may be obtained using a global positioning system receiver or other suitable arrangement. The automobile personal computer may be operated under voice control by using voice recognition to recognize voice commands. The automobile personal computer may also present text to the user through the automobile's sound system using voice-synthesis techniques.

Brief Summary Text (26):
Filtered traffic reports may be provided using location information. Information may be gathered on how the user accesses material with the automobile personal computer, how material is presented to the user, and how the user responds to the material. Targeted content such as targeted advertisements may be provided to the user. The targeted content may be based on a user's interests and location information.

Brief Summary Text (27):
Audio content for the automobile personal computer may be extracted from the Internet. Internet radio stations may be received with the automobile personal computer. If desired, audio advertisements may be used to provide users with subsidized Internet access.

Brief Summary Text (28):
Interactive audio may be provided to the user with the automobile personal computer. For example, audio preview clips may be provided. Users may also respond to polls.

Brief Summary Text (30):
The automobile personal computer may be used to send a traffic report to a service. Language instruction, encyclopedias, contests, games, and digital photography features may be provided by the automobile personal computer. Images such as license plate images may be captured using a digital camera or video camera.

Drawing Description Text (70):
FIG. 69 is a flow chart of illustrative steps involved in extracting content for the automobile personal computer from the Internet in accordance with the present invention.

Drawing Description Text (72):
FIG. 71 is a flow chart of illustrative steps involved in providing a filtered traffic report in accordance with the present invention.

Drawing Description Text (75):

FIG. 74 is a flow chart of illustrative steps involved in providing interactive audio to the user with the automobile personal computer in accordance with the present invention.

Drawing Description Text (80):
FIG. 79 is a flow chart of illustrative steps involved in providing a user with Internet radio stations in accordance with the present invention.

Drawing Description Text (81):
FIG. 80 is a flow chart of illustrative steps involved in providing audio advertisements to the user with the automobile personal computer to provide the user with subsidized Internet access in accordance with the present invention.

Drawing Description Text (87):
FIG. 86 is a flow chart of illustrative steps involved in using the automobile personal computer to send a traffic report to a service in accordance with the present invention.

Drawing Description Text (115):
FIGS. 114-121 are schematic diagrams showing various illustrative arrangements for providing audio content and Internet links in accordance with the present invention.

Detailed Description Text (4):
The automobile personal computer may also communicate with computing equipment in a gas station 20, toll collection facility 22, or drive-through restaurant 24. The automobile personal computer may communicate with hotels such as hotel 26 and other merchants 28. Internet content and other content and services may be obtained from content and service providers 30. Communications services such as e-mail, voice mail, paging services, and other messaging and communications services may be obtained by linking to communications facilities such as communications facilities 32. Emergency services may be obtained by linking with emergency services facilities 34. Other services may be obtained by communicating with various other entities 36. Computing:equipment in the home 38 or office 40 may also communicate with the automobile personal computer.

Detailed Description Text (11):
Automobile personal computer 14 may also receive satellite signals from global positioning system (GPS) satellites 66. By analyzing these signals (e.g., with a GPS receiver), the automobile personal computer can determine the location of the automobile. The resolution of current GPS systems is purposefully limited, by the government. If higher resolution is desired, a differential GPS (DGPS) system may be used. In DGPS systems, the known (e.g., surveyed) position of a base station may be used as a reference point. By comparing the known position of the base station to the position of the base station that is indicated by a GPS receiver at the station, the error of the GPS signal in the proximity of the base station can be determined. If an automobile is relatively close to such a base station (e.g., within a number of miles), the automobile's GPS location may be corrected by the same amount that was determined to be necessary to correct the base station's position.

Detailed Description Text (12):
If desired, the base station and the automobile may be in wireless communications (e.g., using a satellite link or terrestrial wireless link). The DGPS correction to the automobile's position may be made at the automobile (by supplying the needed correction data to the automobile from the base station), at the base station (e.g., by providing the automobile's raw GPS position to the base station), or may be performed elsewhere (e.g., by providing an appropriate facility with the error correction data from the base station over a communications network and by providing the automobile's GPS position data using wireless communications and a communication network path).

Detailed Description Text (15):
Wireless communications with automobile personal computer 14 may be unidirectional (e.g., radio and data broadcasts, satellite radio and data broadcasts, GPS signals, etc.) Wireless communication with automobile personal computer 14 may also be bidirectional. Bidirectional links may support cellular voice and data traffic,

Internet links over either satellite or terrestrial paths, and communications for other interactive services. Bidirectional communications arrangements may use different paths for transmitting and receiving data. For example, a satellite path may be used to deliver information to automobile personal computer 14, whereas automobile personal computer 14 may transmit signals over a terrestrial wireless path. A terrestrial wireless path may be used to deliver information to automobile personal computer 14, whereas automobile personal computer 14 may transmit signals over a satellite path. Different type of satellite paths may be used to form the uplink path and the downlink path to the automobile personal computer. The automobile personal computer may also send and receive terrestrial communications to and from different terrestrial antennas. For example, broadcast data may be distributed by one such terrestrial antenna, whereas communications from the user may be transmitted to another terrestrial antenna.

Detailed Description Text (16):
More than one path may be in use at a time and both unidirectional and bidirectional communications may be mixed. As just one example, the user may be simultaneously receiving satellite GPS signals, a satellite radio broadcast, and a terrestrial data broadcast, may have an open bidirectional cellular data link to a terrestrial antenna, while a local wireless transaction is being consummated over a short-range wireless link.

Detailed Description Text (21):
A schematic diagram of an illustrative automobile personal computer 14 is shown in FIG. 3. Computer 14 may have one or more processors 72 such as a microprocessor 74, a digital signal processor 76, and other suitable processors 78. Storage 80 may include a hard disk drive 82, random-access memory 84, non-volatile memory 86, and any other suitable memory and storage devices. Processors 72 or dedicated circuitry (e.g., analog-to-digital and digital-to-analog converters) in automobile personal computer 14 may support functions such as the decoding of MP3 files or other digital audio, the decoding of streaming Internet audio, voice-recognition functions, voice-synthesis functions, multimedia functions such as handling compressed digital video, streaming Internet multimedia content, etc.

Detailed Description Text (23):
Peripherals 98 used by computer 14 may include a compact disc (CD) drive 100 and a digital video disc (DVD) drive 102. Drives 100 and 102 may be read-only or may permit writing operations. Peripherals 98 may also include a floppy disk drive 104, a PCMCIA interface 106 for PC cards, a memory card reader 108 (e.g., for compact flash cards, smart media cards, memory stick cards, etc.) A smart card reader 110 may be provided to read smart cards or the like. A GPS receiver 112 may be used to receive GPS satellite signals. A scanner 114 may be provided (e.g., to scan in documents for messages, receipts, photographs, or other materials).

Detailed Description Text (32):
Voice commands from the user and other audio information may be received by the automobile personal computer using one or more microphones such as microphone 162. One or more video cameras 164 may be provided. The video cameras may be, for example, mounted to face traffic behind the automobile, in front of the automobile, or to the side of the automobile. Video cameras may also be directed inward to capture video images of the interior of the automobile. A clock 166 may be provided. Time information for the automobile personal computer 14 may be obtained from a discrete clock circuit, part of a more complex circuit such as a processor or application-specific integrated circuit, a remote clock, or any other suitable hardware and software suitable of keeping track of time. Information on the current time may be displayed on a dedicated clock display or may be displayed on a general-purpose display.

Detailed Description Text (34):
A digital camera 170 may be used to take images. Digital camera 170 may capture images of the same type that video camera 164 captures. Digital camera 170 may be mounted on the interior or exterior of the car. Suitable interior mounting locations include the front dashboard (e.g., on movable mount that may be configured to face the exterior of the automobile or may be configured to face the user), the rear window (e.g., to face traffic following the automobile), side windows (e.g., facing the exterior), the

rear-seat area, etc. If desired, digital camera 170 and video camera 164 may be connected to automobile personal computer 14 by a physical communications link or a wireless link. These arrangements, particularly the wireless arrangements, may permit more freedom of movement than arrangements in which such components are mounted to the automobile.

Detailed Description Text (35):
If desired, a wireless link may allow a photographer or videographer to roam away from the car (e.g., while the car is parked) while sending moving or still images to the automobile personal computer. In this situation, the digital camera or video camera may be provided with a wireless transmitter or transmitter-receiver that is capable of communicating with automobile personal computer over a local or remote wireless link. The transmitter or transmitter-receiver may be integrated into the housing of the digital camera or video camera. Images and video provided over such wireless links and images and video provided over physical links may be stored at the automobile personal computer 14 and transmitted from the automobile personal computer 14 to an appropriate recipient at a later time, or may be distributed in real time (e.g., over a wireless Internet. connection or the like that is formed between automobile personal computer 14 and a suitable recipient). Images and video may be transmitted over such remote wireless links using any suitable technique. For example, images and video may be sent using e-mail.

Detailed Description Text (46):
Various architectures may be used with an arrangement such as the arrangement of FIG. 7. For example, automobile personal computer unit 240 or supplemental processor 254 may be configured as a server and the remaining computers may be configured as clients. Web browsers may be used to access the server from the clients, thereby forming an intranet within the automobile. This type of configuration may make it possible for occupants of the automobile to seamlessly access local information and wireless Internet information using the same user interface. This example is merely illustrative. Any suitable type of system architecture may be used to connect multiple processors running in, the automobile personal computer environment.

Detailed Description Text (53):
Steps. involved in installing software on automobile personal computer 14 after automobile 12 has been provided to the user are shown in FIG. 12. Software may be loaded using a storage media or using a communications path. With the storage media approach, the user may be allowed to connect a memory card to the computer or to install a CD or DVD or other removable storage media that contains the new software in a suitable drive at step 290. At step 292, the user may be provided with an opportunity to install the software. For example, the user may be provided with instructions (e.g., audio instructions or on-screen instructions) that guide the through the installation process. With the communications path approach, a link between the computing equipment that is the source of the software and the automobile personal computer 14 is established at step 294. The link may be a wired link (e.g., using a USB cable or other suitable connector) or may be a wireless link. The wireless link may be optical. For example, the link may involve infrared communications between the source computing device and the automobile personal computer. The wireless link may also use radio-frequency communications. The wireless link may be a local wireless link or remote wireless link. After the link has been established at step 294, the software may be downloaded to the automobile computer at step 296. At step 294, the software installation process may be completed.

Detailed Description Text (55):
A local wireless link 310 may be formed between automobile personal computer 14 and electronic devices in a home 312 such as device 313. Device 313 may be connected to a communications network 314 such as the Internet. Automobile personal computer 14 may communicate with communications network 314 (and thus electronic device 313) using remote wireless link 315.

Detailed Description Text (60):
Verbal instructions for the automobile personal computer may be received using microphone 162 of FIG. 1. Signals from microphone 162 may be digitized and processed using digital signal processor 76 and other suitable processors 72 and support circuitry. Such audio signal processing techniques may be used to recognize anywhere

from a few commands to an entire spoken vocabulary. The words that are recognized by the automobile personal computer may be fixed in advance or may be selected by the user. If desired, automobile personal computer 14 may allow the user to train the voice-recognition algorithm to increase the accuracy of the system in recognizing the user's commands. Multiple users may be supported by the system. Each user may train the voice-recognition algorithm separately if desired. If many users are verbally interacting with the computer at the same time, the user-specific voice-recognition capabilities of the computer may be temporarily disabled.

Detailed Description Text (62):
The user may often desire to adjust various settings for the automobile personal computer system. For example, the user may wish to change the default voice-recognition settings, the settings for the automobile's sound system, settings related to an application running on the automobile personal computer, etc.

Detailed Description Text (66):
An illustrative web-based interface that may be used to adjust automobile personal computer settings is shown in FIG. 15. A web browser with interactive controls 328 may be used to allow the user to interact with web page 330. If a direct physical communications link such as a cable is used to connect automobile personal computer 14 and the computing device or if a local wireless link is used, web page 330 may be provided directly to the computing device by automobile personal computer 14. If a remote link is used, web page 330 may be provided from computer 14 or may be supplied by a server on the Internet or other such facility that is remote from computer 14.

Detailed Description Text (72):
Drop-down menus may, for example, allow the user to select radio stations from a list by specifying the band and frequency of each desired station. Band options may include traditional radio formats such as AM and FM. Band options may also include digital terrestrial radio, satellite broadcast radio, Internet radio, and other suitable band options. The drop-down menu for band selection may therefore include entries such as AM, FM, DIGITAL, INTERNET, SATELLITE, etc. Terrestrial digital radio may involve digital audio transmissions from terrestrial antennas. Satellite broadcast radio may involve, e.g., digital music channels that are available by subscription. Internet radio stations may involve the rebroadcast of radio content from a regular broadcast source. Internet radio may be received by automobile personal computer 14 over a satellite or terrestrial wireless Internet link and may be decoded using an application that decodes streaming audio content.

Detailed Description Text (73):
If the user wishes to subscribe to a service to which the user does not presently subscribe (e.g., digital satellite radio service. or Internet service or the like), web page 330 or any other suitable web page may be used to provide the user with ordering options. If the web page is being provided by a source other than the content provider of the service to which the user desires to subscribe, information on the user's order may be provided to the appropriate service provider (e.g., one of content providers 30 of FIG. 1) to consummate the transaction.

Detailed Description Text (76):
As shown in FIG. 16, a single service provider 346 (e.g., an automobile manufacturer or associated entity or a content-related company such as a web portal company or the like) may provide a user of automobile personal computer 14 with a number of different services. Automobile personal computer 14 and user computing device 347 (e.g., a personal computer, handheld computing device, etc.) may be linked to service provider 346 over communications network 349 (e.g., the Internet). Service provider 346 may use an account database 348 to store information on the user s account status. This may allow the user to subscribe to services (e.g., music services, news services, communications services, data services, etc.). These services may be provided using content sources 350 that are maintained by the service provider. Content sources may use servers and may provide content continuously (e.g., music, satellite radio, etc.), periodically (e.g., traffic reports), or on-demand (e.g., Internet content). These approaches may be combined. For example, broadcast radio (e.g., satellite radio or terrestrial radio of other radio broadcast signal) may be combined with Internet access to provide interactive audio content. In this example the interactive component of the audio content uses an Internet link, but any other type of interactive link may

be used if desired.

Detailed Description Text (77):
When the user desires to subscribe to a service, service provider 346 may debit the user's account using database 348. Because service provider 346 has access to the user's account status, the service provider 346 may allow the user to purchase additional products and services using the account. For example, a compact disc being promoted using interactive audio may be purchased from service provider 346. An order processing facility such as order processing facility 352 may be used to process the orders. When a user of automobile personal computer 14 responds to such Interactive audio content, the user's order may be transmitted from automobile personal computer 14 to order processing facility 352 (e.g., over a remote wireless link using network 349 or other suitable communications path).

Detailed Description Text (85):
Devices in the home may be used with the automobile personal computer 14. For example, a small dedicated touch screen device in the home may be used to start automobile 12 by interacting with automobile personal computer 14. Personal computers may also be used to interact with automobile personal computer 14. For example, settings may be adjusted or the car remotely controlled from a personal computer over the Internet or other suitable remote link using an interface such as the interface of FIG. 15.

Detailed Description Text (87):
A home 364 that contains various illustrative electronic devices is shown in FIG. 19. Although possible, it is not necessary to include all of the devices shown in FIG. 19 in a single home. These devices are depicted in a single drawing for clarity. As shown in FIG. 19, automobile personal computer 14 may communicate with the devices in home 364 using a remote wireless link 366 or a local wireless link 368. A thin server 370 that contains suitable communications circuitry for communicating over a remote wireless link or a local wireless link may be interconnected with a number of client devices 372. The client devices may be small dedicated sensor and control devices, electronic appliances (e.g., web appliances), computing devices (e.g., a personal computer), etc. Thin server 370 may act as a residential gateway to communications networks such as the telephone network and the Internet. Thin server 370 may communicate with automobile personal computer 14 through a remote wireless path that involves such a communications network. Thin server 370 may also have a wireless receiver and transmitter for communicating with automobile personal computer 14 directly over a local wireless link.

Detailed Description Text (88):
Automobile personal computer 14 may also communicate with personal computers such as personal computers 374 and 376 over a remote wireless link that terminates by passing through a dedicated communications device 378 in the home such as a shared-access modem. If desired, communications device 378 may be part of a residential gateway platform. A handheld computing device 380 may communicate with personal computer 374 over a wireless link such as an infrared link or using a cable. This allows user commands from handheld computing device 380 to be passed to automobile personal computer 14 and allows information from automobile personal computer 14 to be passed to handheld computing device 380. Web appliances such as web appliance 382 and other electronic information and control appliances 384 may also be connected to automobile personal computer 14 through dedicated communications device 378. Web appliances may be used to access Internet or intranet, web page content and my commitment with dedicated communications device 378 or other suitable equipment using a local wireless link. Dedicated communications device 378 may have wireless transmitter and receiver circuitry that supports communications with automobile personal computer 14 over a local wireless link.

Detailed Description Text (89):
If desired, a personal computer such as personal computer 386 may have communications circuitry for communicating with automobile personal computer 14 over a remote wireless link or a local wireless link. Personal computer 386 may be networked with other personal computers such as personal computer 388. If desired, personal computer 386 may be configured to serve as a residential gateway to the Internet. Various home sensors and control devices 390 may also be connected to personal computer 386. By virtue of their connections with personal computer 386, personal computer 388 and

sensors and control devices 390 may communicate with automobile personal computer 14. A handheld computing device 392 that is in wireless communication with personal computer 386 may communicate with automobile personal computer 14 using its own communications circuitry (e.g., communications circuitry for communicating with automobile personal computer 14 over a remote wireless link or a local wireless link) or may communicate with automobile personal computer 14 through personal computer 386.

Detailed Description Text (95):
The communications circuitry used by the in-home devices of FIG. 19 to communicate with automobile personal computer 14 over a remote wireless link may include, for example, a modem such as a telephone modem, cable modem, ISDN modem, DSL modem, or any other suitable wired communications circuitry for connecting to the telephone network, or the Internet, or other suitable communications network through a wired path. The automobile personal computer may be connected to the communications network using a wireless terrestrial communications path or a satellite communications path.

Detailed Description Text (98):
As the user arrives home in automobile 12, the user may use the automobile personal computer 14 to forward information to the devices in the home and may use automobile personal computer 14 to control the devices within the home. For example, the user may open the garage door and turn on the exterior home lights using automobile personal computer 14. This may be done automatically when the automobile personal computer 14 detects that the automobile is headed toward the home. The user's location and heading may, for example, be determined using the location and direction capabilities of GPS receiver 112 (FIG. 1).

Detailed Description Text (106):
The information for region 406 may be obtained, for example, from an Internet service or the like. Suitable information for region 406 may include weather, news, stock quotes, or any other suitable information. If desired, the information that is displayed in region 402 may be personalized for the user.

Detailed Description Text (111):
FIG. 22 shows an illustrative arrangement in which an in-home electronic device 430 has dedicated buttons 432, 434, 436, and 438. Associated on-screen labels 440 may be displayed adjacent to each dedicated button. The user may select the start car option by pressing button 432. This wirelessly starts automobile 12. If the user presses button 434, the user's e-mail is retrieved and displayed, in information region 442. If button 436 is pressed, radio content is played through speaker 444. The user may tune to a desired radio station (e.g., an AM or FM or Internet station using speaker 444). News (e.g., from the Internet) may be displayed in information region 442 when button 438 is pressed.

Detailed Description Text (118):
The location of automobile 12 may be determined using GPS receiver 112 (FIG. 3) or using network-based techniques. Location information may be provided as geographical coordinates or may be converted to a street address (e.g., by performing a look-up operation in a map database on a CD or the like).

Detailed Description Text (119):
Illustrative steps involve in using location information to provide the user with location-sensitive directions are shown in FIG. 27. At step 472, the location of automobile 12 is determined (e.g., by using GPS, DGPS, network-based location schemes, or any other suitable approach). If the location information is provided, by a facility that is distant from the automobile personal computer, the location information may be provided to the automobile personal computer over a remote or local wireless link. At step 474, the user may be provided with an opportunity to supply destination information to the automobile personal computer. The destination information may be supplied by pressing buttons on the front panel of the automobile personal computer, by pressing options that are displayed on a touch screen, by interacting with automobile personal computer 14 using voice commands and audio prompts, by using a pointing device such as a trackball or the like to interact with on-screen options, using handwriting recognition, using a pen-based input device, or using any other suitable approach. At step 476, the automobile personal computer may

provide the user with directions based on the known current location of the automobile and the destination information supplied by the user. The directions may be provided as audio played through the automobile's sound system. Directions may also be displayed on a suitable display. A graphical interface may be used to indicate the user's current position, the destination, and the preferred route.

Detailed Description Text (121):
Location information may be used to assist the user in locating automobile 12 in a parking lot. It can be difficult to remember where one has parked, particularly if the lot is large, if there is more than one lot, or if a period of time has passed since the user has parked. With the configuration of FIG. 29, a publically-accessible kiosk may be provided at a mall, airport, stadium, or any other suitable facility 486 at which the user may need to retrieve their automobile 12 from a parking lot 488. The kiosk 484 may have a display 490. Interactive advertising and promotions may be provided, as illustrated by interactive advertisement 492. This allows the user to purchase goods and services (e.g., over the Internet or using any other electronic technique). A credit card reader 494 or the like may be provided so that the user may easily use a credit card to purchase products.

Detailed Description Text (123):
Once automobile personal computer 14 has been identified and the user's identity verified, the location of automobile personal computer 14 may be determined. The location of automobile personal computer 14 may be determined using any suitable technique. For example, kiosk 486 may establish a local or remote communications link with automobile personal computer 14 and obtain information on the automobile's location from a GPS receiver in the automobile. Wireless network information may also be used to triangulate the position of automobile 12. Regardless of how the user's automobile is located, kiosk 486 preferably provides information on the automobile's location to the user. The location information may be provided in any suitable form. For example, a map 496 may be displayed on screen 490. The map and coupons and other promotional information may be printed using printer 498. Printer 498 may also be used to provide a text description of the location of the user's automobile.

Detailed Description Text (124):
Automobile personal computer 14 may display clock information (e.g., the current time) to the user on a faceplate display or any other suitable display or may provide this information to the user through the automobile's sound system in response to a command from the user. If desired, location information may be used to automatically change the clock time that is displayed to the user as the user travels from one time zone to the next. Steps involved in providing this feature are shown in FIG. 30. At step 500, a GPS signal is broadcast from satellites in the GPS system. At step 502, the GPS position signals and GPS clock signals may be obtained from the satellites by GPS receiver 112 an automobile personal computer 14. At step 504, any errors in the time of the clock other than time zone errors may be corrected based on the received GPS clock signal. At step 506, the current geographical location of automobile 12 may be determined based on the received GPS position signals. At step 508, the current time zone in which automobile 12 is located may be determined based on the geographical location data. For example, automobile personal computer 14 may consult a local or remote map database to determine the current time zone. If automobile personal computer 14 determines that the user has changed time zones, the on-board clock may be updated accordingly and the user alerted at step 508.

Detailed Description Text (125):
If desired, automobile personal computer 14 may use location information to determine when the user is headed toward home. This may allow automobile personal computer 14 to prepare the user's home for the user's arrival. Illustrative steps involved in this type of arrangement are shown in FIG. 31. At step 510 the location of automobile 12 is monitored to determine whether the user is headed toward home. For example, information on the user's home address may be stored in a database (e.g., a database maintained by automobile personal computer 14). Automobile personal computer 14 may use a GPS reading to determine the user's location and bearing. The user's location and bearing may be compared to the stored information on the user's home address to determine whether the user is within a certain radius of the home and has a bearing (instantaneous or averaged) that is directed toward the home. If desired, automobile personal computer 14 may just determine whether the automobile is less than a certain

predefined distance from the home.

Detailed Description Text (132):
At step 518, vehicle conditions may be monitored. Automobile personal computer 14 may use vehicle electronics 174 (FIG. 4) to detect the state of the vehicle. Any suitable vehicle condition may be monitored, such as airbag deployment, rapid deceleration, high speeds, roaming outside of a specified range, unauthorized attempts to operate the vehicle, starting the engine, exceeding speed limits, following too close behind vehicles, having other vehicles follow too close behind, etc. The location of the vehicle and its bearing may be determined using GPS techniques or other location-determination techniques.

Detailed Description Text (135):
A database-backed web page may be automatically updated or otherwise changed in response to the action. The web page may be provided by a server on the Internet or any other suitable arrangement. The web page may be modified by automatically modifying the database when the specified action is taken. This may be accomplished, for example, by having automobile personal computer 14 or other equipment send commands to the database to make the modification. The server may modify the database in response to the commands.

Detailed Description Text (136):
E-mail reports on the behavior of a driver of an automobile may be sent to another party. This type of arrangement may. be used by a parent to monitor the driving behavior of a child. It may also be used to monitor whether one's automobile has been moved after it has been left with a parking attendant or valet parking. Any suitable information may be included in such reports, such as information on the speed of the automobile, the location of the automobile, where and when the automobile is started and stopped, etc. Steps involved in an illustrative example are shown in FIG. 33. At step 522, the user (e.g., the parent) may be provided with an opportunity to direct the automobile personal computer 14 to monitor the speed of the automobile relative to the speed limit. Speed limit information may be stored in a map database (e.g., a local map database maintained on a CD or DVD or in storage 80 or other suitable storage media by automobile personal computer 14 or a remote database maintained on a server). The speed of the automobile may be monitored using speedometer 190 (FIG. 1) or GPS receiver 112 (FIG. 2), etc.

Detailed Description Text (137):
At step 524, the automobile personal computer 14 may monitor the driver by determining the location of the driver (e.g., the child) and the speed of the vehicle and comparing this information to the database speed limit information. When the measured speed of the automobile at a given location exceeds the posted speed limit that is listed for that location in the database this information may be provided to the user at step 526. The results of the monitoring operation may be provided to the user as an e-mail notification or this information may be made available on a web site. To avoid triggering the transmission of numerous e-mails during a single monitoring session, the user may set up the system to send consolidated reports. For example, the user may direct that a report be sent once each hour, only when the automobile is started or stopped, only if the speed limit is exceeded, only if the automobile is driven beyond a certain distance from the home, etc. E-mail reports may contain information on the time and date and location of each detected event. Graphic images such as maps showing the driving route taken and indicating where events took place may be provided as, e-mail attachments. These examples are merely illustrative. Any other suitable driving events may be detected and the monitoring party may be provided with information on the detected events using various arrangements.

Detailed Description Text (139):
If desired, automobile personal computer 14 may be used to track stolen vehicles. Illustrative steps involved in tracking automobile 12 with automobile personal computer 14 are shown in FIG. 34. At step 528, a default tracking setting may be used or the user may be provided with an opportunity to invoke the tracking mode. For example, the user may set an alarm by informing the automobile personal computer that the vehicle is not to be moved. If the user returns to the automobile, the user may release the alarm. If the automobile is jostled (as detected by inertial sensors) or is moved (as detected by inertial sensors or the GPS receiver or the odometer, etc.)

before the alarm is released, the automobile personal computer will be able to conclude that the automobile has been stolen or is about to be stolen.

Detailed Description Text (141):
If automobile 12 is stolen, the location of the automobile 12 may be tracked at step 534 using location data (e.g., GPS location data). Various parties may be notified at step 534. For example, the owner of the automobile may be notified. Additional parties that may be notified include a service provider, the police, an insurance company, etc. If desired, automobile personal computer 12 may play a warning message through the automobile's sound system that alerts the occupant of the vehicle that a theft has been detected, that the automobile's location is being monitored and the police have been notified.

Detailed Description Text (146):
At step 540, the automobile personal computer may monitor the user's behavior using a camera directed toward the user. If the user is not moving much or if it can be determined whether the user's eyes are closing (using, e.g., digital image processing techniques), the user may be fatigued. Other tests that may be performed to assess fatigue involve monitoring the user's responsiveness to turns in the road, monitoring whether the user is drifting out of the marked lanes on a road, etc. Wireless beacons along the road that are in wireless communications with automobile personal computer 14 may be used to help identify the course of the roadway. If desired, GPS techniques or network-based location techniques may be used to track the location of automobile 14 relative to the road.

Detailed Description Text (148):
The results of driver and vehicle monitoring operations may be made available to various parties using a web-based approach. Illustrative steps involved in this type of arrangement are shown in FIG. 36. At step 544, images may be captured (e.g., of the interior of the automobile or of any other suitable subject) and information on the vehicle may be gathered (e.g., using vehicle electronics 174 of FIG. 4). At step 546, the automobile personal computer may supply the images and vehicle information to a server over the Internet. At step 548, the user and other parties may be provided with an opportunity to access the images and other vehicle information. For example, a web browser may be used to access this information. Web pages containing the information may be placed under password control to protect the privacy of the user.

Detailed Description Text (151):
The information that is collected at steps 550 and 552 may be stored locally in automobile personal computer 14 and transferred to a server (e.g. a server on the Internet) at any suitable interval. If desired, the information that is collected at steps 550 and 552 may be transferred to a server (e.g., a server on the Internet) at relatively infrequent intervals such as once per month or more frequently (e.g., once per day, once per hour, etc.) Maintenance information that is generated by service technicians at a service facility may be provided directly to such a server if desired. Performance and maintenance information may be transferred to the server using wired or wireless links. If wireless links are used, a remote link (e.g., a satellite or terrestrial cellular link or the like) or a local link (e.g., a short-range wireless link in the service facility or the like) may be used.

Detailed Description Text (159):
Any of the vehicle performance and maintenance information and user-configurable options that may be provided using the web page arrangement of FIGS. 37 and 38 may be provided using other formats and arrangements. For example, this information may be stored in storage 80 of automobile personal computer 14 and accessed locally. The user may access this information verbally using voice recognition and voice synthesis or may access the information using buttons, on-screen options, etc.

Detailed Description Text (163):
Illustrative steps involved in using system 30 to provide this feature are shown in FIG. 40. At step 576, the automobile personal computer detects that the automobile is being driven or that the user is present in the vehicle. Any suitable sensor or arrangement may be used to detect use of the vehicle. For example, an ignition sensor may be used to detect when the automobile engine is running. Any suitable location scheme may such as a GPS arrangement or network-based location determination scheme

may be used to determine when the automobile is moving or is away from the home. Automobile motion may also be detected using inertial sensors, a speed sensor, an odometer sensor, etc. Automobile personal computer 14 may also recognize when the user is pressing buttons on computer 14 or is vocally interacting with computer 14, which both indicate that the user is in automobile 12.

Detailed Description Text (178):
Steps involved in limiting which devices may be used to remotely control automobile 12 are shown in FIG. 45. At step 616, the user may be provided with an opportunity to limit which devices can control the user's automobile. The settings for this feature may be stored in any suitable location, such as in the automobile personal computer, or on a service provider server, etc. The user-selected settings may be communicated to this storage location from the user's location using any suitable communications path (e.g., over the Internet).

Detailed Description Text (187):
As shown by step 630 of FIG. 46, the user may use a user device such as a handheld computing device, portable computer, personal computer, web appliance, in-home electronic device, or other suitable control or information appliance to obtain information on the location of automobile 12. This may allow the user to locate automobile 12 in a large parking lot or the like or to monitor the location of the automobile 12 when it is being driven by someone else. The location information may be provided as geographical position information (e.g., GPS coordinates) or in a more contextual format. For example, automobile location information may be provided in the form of a street address or a graphic map with an icon or other indicator that indicates the location of the automobile.

Detailed Description Text (188):
Illustrative steps involved in obtaining contextual location information from a database maintained by automobile 12 are shown in FIG. 47. At step 632, the user uses the user device to query automobile 12 for its location. At step 634, automobile personal computer 12 obtains GPS coordinates from GPS receiver 112 or otherwise determines its geographical position. Automobile personal computer 14 also determines the corresponding street address or other contextual location information corresponding to the geographical position information using a local map database or the like that is stored on a CD or DVD in or on storage 80 or other suitable storage media in automobile 12. At step 636, automobile personal computer 14 supplies the street address or other contextual location information to the user device. The contextual location information may, for example, indicate which airport parking lot automobile 12 is parked in or which section of a stadium parking lot the automobile is parked in, etc. The contextual location information may be provided in any suitable format, including text, graphics, audio, and video.

Detailed Description Text (189):
Contextual location information may also be obtained using a database that is remote from automobile 12. Illustrative steps involved in obtaining contextual location information with this type of arrangement are shown in FIG. 48. At step 638, the user device may be used to query automobile personal computer 14 on its location. At step 640, automobile personal computer 14 obtains GPS coordinates from GPS receiver 112 or otherwise determines its geographical position. At step 642, the user device or the automobile personal computer accesses a map or address database that is remote from automobile 12. A database look-up operation may be performed on the remote database at step 642 to determine the contextual location (e.g., the street address, etc.) of automobile 12 based on the coordinates supplied at step 638 and to supply this information to the user device.

Detailed Description Text (200):
The user may adjust certain settings in automobile personal computer to facilitate payment during financial transactions. Illustrative steps involved in setting up payment arrangements with automobile personal computer 14 are shown in FIG. 51. At step 686, the user may be provided with an opportunity to supply automobile personal computer 14 or a remote server with credit card information, debit card information, information on accounts that have been set up with service providers or other entities, etc. For example, the user may be provided with an opportunity to supply the information directly to automobile personal computer 14 or using a local or remote

wireless link. The user may be provided with an opportunity to supply the information to the remote server over the Internet, through a customer service representative, or using any other suitable approach. At step 688, the user may be provided with an opportunity to assign certain merchants or classes of merchants to certain user accounts or credit or debit cards. The user may accomplish this by interacting with automobile personal computer 14 or the remote server. As an example, the user may adjust settings so that all purchases at a particular gas station use that gas station's credit card. All transactions involving fast food restaurants may use another credit card and all transactions involving lodging may use yet another credit card. All automatic teller machine (ATM) transactions may use a debit card. All highway toll payments may use a toll payment account. These are merely illustrative examples.

Detailed Description Text (206):
Electronic materials such as software, text, audio, and video content may be downloaded from kiosks or remotely using remote wireless links. One suitable approach involves downloading an audio tour from a kiosk over a local wireless link or from a remote server over a remote wireless link. Illustrative steps involved in wirelessly downloading and using a tour are shown in FIG. 53. At step 698, the user may use the automobile personal computer to download tour information (e.g., form a kiosk over a local wireless link or from a remote server using a remote wireless link). At step 700, while the user is driving around the region covered by the tour, the location of automobile 12 may be determined (e.g., using GPS techniques or other techniques). Automobile personal computer 14 may use the location information to synchronize the playback of the audio tour with the user's present location at step 702. If desired, audio tours can be used without tying the playback of the audio to the automobile's location.

Detailed Description Text (207):
If desired, the information for the tour may be provided to automobile personal computer 14 in real time (e.g., using a remote wireless Internet link). The tour information that is provided may be specific to the user's present location or may be more general information that the automobile personal computer filters based on the location. The user may specify the desired location (e.g., using voice commands, etc.). Because a large amount of tour information may be stored on remote servers, arrangements in which tour information is stored remotely and obtained by the automobile personal computer 14 when needed allow users who travel to have access to a large repository of possible tours from which to choose. The user may access the Internet using automobile personal computer 14 and may select desired tours using a web browser. If the automobile's location is determined (e.g., by GPS), such location information may be used to synchronize the delivery of the tour to the user. The tour's content may be synchronized at the remote server or at the automobile personal computer 14.

Detailed Description Text (219):
Electronic parking meter 738 may be connected to a computer 744 at a central office 746 over a communications network (e.g., the Internet, or the telephone network, or any other suitable communications paths). The central office 746 can handle customer service issues, can maintain accounts for users, may send status reports or bills or tickets or the like to users through the mail, by e-mail, etc.

Detailed Description Text (223):
As shown in FIG. 59, a user at automobile 12 may use automobile personal computer 14 to purchase gasoline from a gas station 758 over a wireless link (e.g., a local wireless link). Gas pumps at the station such as gas pump 762 may have wireless communications circuitry 764 and processing circuitry 766 for handling wireless transactions. Gas pump 762 may be connected to a computer 768 at a central office 770 over a communications network 772 (e.g., the Internet). This allows personnel at the central office to monitor transactions from numerous gas stations. User information such as account information may be stored at processor 766, computer 768, or other locations if desired.

Detailed Description Text (225):
One illustrative way in which the user may be provided with an opportunity to negotiate for the price of the gas or a discount for the gas involves using a server

(e.g., a server on the Internet that the user accesses over a remote wireless Internet link using a web browser running on automobile personal computer 14 such as an audio-enabled web browser) to provide the user with information on several gas stations of interest in a particular area. The user may make a financial commitment (e.g., with a credit card) indicating a willingness to purchase a certain amount of gas at a certain price (e.g., 10 gallons at $1.00 per gallon). A server may then run a process that allows various gas stations or gas companies to bid for the user's business. If a seller accepts the user's offer, the user's credit card or account is charged or a hold is put on the credit card or account to cover the purchase amount. A transaction fee may be levied by the service provider that runs the server).

Detailed Description Text (233):
If desired, gas may be purchased without using a local wireless link. Illustrative steps involved in this approach are shown in FIG. 61. At step 790, the user may, if desired, use automobile personal computer 14 to contact a server (e.g., a server on the Internet) that allows the user to negotiate a price for gasoline, obtain information on gasoline prices, receive promotional offers and discounts, etc. As with step 774 of FIG. 60, the user may be asked to make a financial commitment in order to receive a better price.

Detailed Description Text (236):
A gas station may reward an automobile personal computer user for gasoline purchases. Illustrative steps involved in rewarding a user are shown in FIG. 62. At step 796, automobile personal computer 14 may be used to provide the user with an opportunity to determine the location of a gas station of interest. Any suitable technique may be used to provide the user with information on the gas station. For example, the current location of automobile 12 may be determined using GPS or any other suitable location technique. A database containing information on points-of-interest may be searched to locate points of interest (including gas stations) that are nearby, based on the user's present location and heading. Such a database may also be searched manually. Such a database may be maintained locally on automobile personal computer 14 (e.g., on a CD, DVD, hard drive, or other storage medium) or may be maintained remotely (e.g., on a server). When potential gas stations are located, this information may be presented or displayed to the user using audio or visual techniques. For manual searching (i.e., searching based on user inputs rather than GPS location data), the database may be organized by city, by county, by state, by neighborhood, by highway exits, etc. If desired, the user may enter verbal commands to obtain the desired information from the database. For example, the user might instruct the automobile personal computer to locate matches to the query "gas station and exit 25 of I-95" or the like.

Detailed Description Text (247):
Automobile personal computer 14 may also identify which protocol to use based on location information. In particular, automobile personal computer 14 may be used to gather location information as the user is driving (e.g., using GPS techniques or any other suitable techniques). The location information may be used to determine the current region in which the automobile is located. By identifying the current region in which automobile 12 is located, automobile personal computer 12 may determine which communications protocol is in use at nearby toll collection facilities. This protocol may then be used during toll collection.

Detailed Description Text (253):
A shopping service implemented on a remote server may provide the user with an opportunity to negotiate for the price of various items or to obtain discounts or the like. The user may access the server from any suitable computing device over a communications network such as the Internet. The server may be accessed by the user using the automobile personal computer (e.g., over a remote wireless Internet link using a web browser running on automobile personal computer 14 such as an audio-enabled web browser). The server may provide the user with information on different shopping items of interest at a particular store or stores in the user's area. The user may make a financial commitment (e:g., with a credit card) indicating a willingness to purchase a certain items at certain prices. The remote server may then run a process that allows various stores or manufacturers to bid on the user's offers. If the user's offer is accepted, the user's credit card or account is charged or a hold is put on the credit card or account to cover the purchase amount. A transaction

fee may be levied by the service provider that runs the server. The items for which the user's bids were accepted may be added to the shopping list or may form their own shopping list. This shopping list may be stored on automobile personal computer 14 or the remote server, which may be accessed by automobile personal computer 14.

Detailed Description Text (256):
Illustrative steps involved in using automobile personal computer 14 to facilitate purchase transactions in which there is negotiation of prices prior to the purchase are shown in FIG. 67. At step 854, automobile personal computer 14 may be used to provide the user with an opportunity to negotiate the price of a product or service (e.g., food, gas, lodging, etc.) with a merchant or other entity. For example, the user may be provided with an opportunity to submit a bid for an item that the user desires to purchase. A service implemented on a remote server may provide the user with suggested prices or retail prices for the various products or services. The service may levy a transaction fee. The user may access the server using the automobile personal computer (e.g., over a remote wireless Internet link using a browser application running on automobile personal computer 14 such as an audio-enabled web browser). The user may make a financial commitment (e.g., with a credit card) indicating a willingness to purchase certain products and services at certain prices. The remote server may then run a process that allows various merchants or manufacturers to bid on the user's offers. If an offer of the user's is accepted, the user's credit card or account may be charged or a hold may be placed on the credit card or account to cover the purchase amount.

Detailed Description Text (262):
The user may use automobile personal computer 14 to access Internet content and other information over remote wireless links. For example, Internet content may be obtained using satellite links or wireless RF terrestrial links (e.g., cellular links). Internet content such as web pages may be displayed without significant modification using large flat-panel displays. The driver may view Internet content on such displays when the automobile is not being driven. Passengers may view such Internet content more freely. Nevertheless, the driver may sometimes be the only occupant of the automobile. Moreover, the automobile may only have small displays such as a front-panel display on an in-dash (personal computer unit.

Detailed Description Text (263):
It is therefore desirable to provide users with access to Internet content that is adapted for small displays and audio presentation techniques such as voice synthesis. One approach that may be used is shown in FIG. 69. Automobile personal computer 14 may run a web browser, or other interface application 820 that accepts content in various formats and presents it to the user. The content from standard web pages such as web page 822 may be translated into a format that is compatible with the automobile personal computer's presentation capabilities. The content of web pages that are particularly formatted for small displays such as web page 824 does not need to be substantially modified before it is presented to the user by web browser 820. Similarly, audio content on web pages such as web page 826 may be presented to the user (e.g., through the automobile's sound system) without modification. Some web pages such as web page 828 may be designed to contain only or mostly audio content 830 and content 832 that is suitable for display on small displays. Browser and interface application 820 may handle content with any suitable formats or protocols such as hypertext markup language (HTML), extensible markup language (XML), voice extensible markup language (VXTML), wireless access protocol (WAP), etc.

Detailed Description Text (264):
As shown in FIG. 70, automobile personal computer 14 may receive wireless content such as audio files 834, video files 836, web pages 838, Internet content 840, and other data, software, etc. 842. Content may be received on request, periodically, or as a continuous stream. Content that may be received on request may include, for example, Internet content that is delivered to the user from a remote server. In this situation, automobile personal computer 14 is acting as a client processor. Content that may be received periodically includes e-mail messages, periodic news reports, paging messages, updates to databases, etc. Content that may be received continuously includes broadcast information such as radio and continuous data broadcasts. Such broadcasts may be provided over Internet links or may be provided in parallel with Internet links. As an example, radio broadcasts may be provided to automobile personal

computer 14 at the same time as an Internet connection is made available using a different communications path. The user may listen to the audio content that is being provided on the radio broadcast, while interacting with the audio content in real time using the Internet link. These are just a few illustrative examples. Moreover, content may be received using combinations of these techniques or any other suitable technique if desired.

Detailed Description Text (265):
Automobile personal computer 14 may receive traffic reports that are filtered based on the user's location or intended route for travel. Illustrative steps involved in using automobile personal computer 14 to receive traffic reports are shown in FIG. 71. At step 844, the user may select a desired route for travel. Automobile personal computer 14 may provide the user with an opportunity to press buttons or speak or otherwise indicate the desired starting point and destination of travel. If desired, location data from GPS receiver 112 or other location technique may be used to provide the starting point data. If the user drives the same route often (e.g., as for a commute), this information may be stored. The user may be provided with an opportunity to select a trip itinerary or a destination from a list of popular, last-visited (as determined by tracking the automobile's location), or last-entered, or default itineraries or destinations.

Detailed Description Text (266):
At step 846, automobile personal computer 14 may gather traffic report information and filter out data for all but the user's selected route. The traffic report information may be provided as an FM data feed, a satellite data feed, an e-mail report or other message, as data requested from the Internet or the like, or in any other suitable format. At step 848, the filtered traffic report may be presented to the user. For example, text, graphics, and video information may be displayed for the user and audio information played for the user through the sound system. Text may also be presented to the user in audio form using voice-synthesis techniques.

Detailed Description Text (268):
During step 850, automobile personal computer 14 may monitor which radio stations the user tunes to. Automobile personal computer 14 may also monitor what type of Internet content the user searches for and retrieves. Information may be collected on which audio files the user downloads and which applications the user runs. The automobile personal computer may also monitor how many e-mail messages the user sends and receives and the recipients and senders of such messages.

Detailed Description Text (269):
Driving-related information may be monitored using vehicle electronics 174 and GPS receiver 112. For example, automobile personal computer 14 may monitor how frequently the user drives and how fast the user drives. The locations the user visits in automobile 12 may also be monitored. Service-related information such as the odometer reading and diagnostic codes of the automobile may be monitored. These are merely illustrative examples. Automobile personal computer 14 may monitor and gather information on any suitable user activity involving the automobile personal computer if desired.

Detailed Description Text (271):
Moreover, the user may be provided with opportunities to enter preference information. For example, the user may enter information on the user's most frequent driving routes, so as to be able to receive targeted traffic reports. This is merely an example. The user may supply information on any of the user's preferences if desired. If the user does not want to divulge the information that automobile personal computer collects, the user may fully or partially disable the monitoring functions. For example, the user may turn off location-based tracking.

Detailed Description Text (273):
As an example, traffic reports may be presented to the user based on the travel routes in which the user is interested. Stock price reports may be delivered based on which stocks the user has explicitly selected or based on which stocks the user has purchased on-line using automobile personal computer 14. News may be provided based on the user's most frequented geographic locations. If the user drives extended distances, advertisements may be provided to the user for new tires or maintenance

plans or roadside assistance services. If location data indicates that the user is often in the parking lot of an airport, the user may be presented with promotions for airline tickets. If the user is frequently located in the parking lot of a certain store, that store or type of store may be promoted to the user (e.g., an e-mail may be sent to the user when the store is having a sale, etc.) The user may also be presented with custom radio stations based on the user's preferred genres of radio content. These are just a few illustrative examples. Any suitable type of informational or promotional content may be presented to the user using filtering and targeting based on the interests of the user.

Detailed Description Text (274):
Targeted information may be presented to the user based on the automobile's location. Illustrative steps involved in presenting information to the user based on location information are shown in FIG. 73. At step 868, automobile personal computer 14 may be used to determine the user's interests (as at step 850 of FIG. 72). At step 870, the location of automobile 12 may be determined (e.g., automobile personal computer 14 may be used to determine the location of automobile 12). The location of automobile 12 may be determined using GPS receiver 112 or any other suitable location-determining arrangement. The projected location of automobile 12 may be determined from GPS heading data or from destination information provided by the user or using any other suitable approach. At step 872, a local database at automobile 12 or a remote wireless link to a remote database may be used to provide the user with access to information on restaurants, hotels, and other merchants and services that are in the vicinity of the present or projected location of automobile 12. For example, automobile personal computer 14 may provide the user with an audio or visual list of matching merchants and may provide the user with an opportunity to contact these merchants.

Detailed Description Text (278):
After the user selects a merchant of interest, the user may be provided with driving directions and an opportunity to make hotel reservations, pay for a hotel, make restaurant reservations, order or reserve food from a drive-through restaurant, etc. The user may be allowed to contact a merchant using any suitable technique. For example, the user may be provided with an opportunity to have automobile personal computer automatically establish a cellular or satellite telephone link to a merchant of interest (e.g., a particular hotel). The user may also contact the merchant by e-mail or other messaging technique. Listings may be presented to the user in the form of interactive audio and visual advertisements, so that when the user responds a reservation is automatically made (based on financial and personal information on the user that is maintained by automobile personal computer 14). For example, the user may respond to the presentation of an audio advertisement for a nearby hotel by speaking the command "make reservation now" or by interacting with a visual interface (e.g., an on-screen option, a front-panel "select" button, a dedicated purchase button, etc.). The automobile personal computer may then automatically make the reservation by contacting a remote server at the hotel or a reservations services provider and by providing the user's financial and personal information.

Detailed Description Text (279):
More detailed information (e.g., how many nights the user desires to stay, how many beds are required, etc.) may be handled by the automobile personal computer using interactive audio prompts and voice commands or using a visual interface at step 874. If the transaction is completed, automobile personal computer 14 may provide the user with driving directions to the merchant. Information for the driving directions may be obtained from a local database or a remote database.

Detailed Description Text (281):
Automobile personal computer 14 may be used to allow the user to interact with radio and other audio content. As one example, the user may be provided with a broadcast audio signal and simultaneous Internet access. Interactivity may be provided by using the Internet link to interact with a remote server (e.g., a remote server at a merchant). Illustrative steps involved in using various interactive audio arrangements are shown in FIG. 74. At step 878, the user may be provided with access to audio having an interactive content component. A user may, for example, be provided with audio content from a terrestrial or satellite broadcast source. Audio content may also be provided in the form of downloaded audio files (e.g., MP3 files) or streaming Intranet audio. At step 880, the audio content may be played through the automobile's

sound system. If there are any accompanying components of the content that may be displayed visually, automobile personal computer 14 may display these components on a suitable display at step 880. At step 882, automobile personal computer 14 may be used to provide the user with an opportunity to respond to interactive advertisements or other interactive content to order or purchase products or services or to request information, etc.

Detailed Description Text (283):
Interactive advertisements and the like may be associated with terrestrial or satellite radio broadcasts. If desired, the interactive content component of such broadcasts may only be presented to users who can respond to the interactive content. This may be accomplished using any suitable approach. For example, advertisements that accompany broadcast audio content may be provided as digital audio streams or digital audio clips that are only accessible by automobile personal computers configured to receive such digital streams or digital clips. Digital audio content may be provided in packets with associated packet identifiers or other identifying information. Different types of digital audio content may be identified by analyzing the packet identifiers (e.g., by consulting a table or other data structure in which each packet identifier is associated with a particular type of digital audio content). If desired, interactive audio streams may be provided by streaming Internet audio over an Internet link.

Detailed Description Text (284):
Visual information may be received and displayed in conjunction with the presentation of audio materials. If desired, the interactive audio components that are associated with noninteractive audio content received by automobile personal computer 14 may be provided as text that may be read to the user using the automobile's voice-synthesis capabilities.

Detailed Description Text (286):
Similar interactive audio techniques may be used to promote news-related products and services, financial services, shopping services (e.g., related to cloths, books, or gifts), music-related products or services, banking-related, weather-related, automobile-related, or business-related products or services, etc.

Detailed Description Text (291):
If desired, highly targeted audio material may be presented to the user based on the location of automobile 12, the user's interests 14, and the audio content being delivered (e.g., the audio content currently being broadcast or streamed to the user or downloaded audio content that the user is currently playing through the automobile's sound system. Illustrative steps in providing such targeted materials to the user are shown in FIG. 77. At step 896, the user's interests may be determined by monitoring the user's preferences, membership and status in rewards programs, recent purchases and hotel stays, and other such user characteristics (as at step 850 of FIG. 72). At step 898, the location of automobile 12 may be determined (e.g., by GPS or other techniques using automobile personal computer 14). At step 900, automobile personal computer 14 may present targeted materials to the user based on the current or projected location of automobile 12, the user's interests, and the nature of the current audio content being presented to the user.

Detailed Description Text (301):
Automobile personal computer 14 may allow the user to play Internet radio stations through the sound system of automobile 12. Illustrative steps involved in providing the user with Internet radio content are shown in FIG. 79. At step 910, automobile personal computer 14 may be used to establish a wireless Internet connection with a suitable service provider over a remote wireless link.

Detailed Description Text (302):
At step 912, the user may be provided with an opportunity to select a desired Internet radio station. For example, the user may be provided with an opportunity to issue voice commands to automobile personal computer 14 or to make selections using buttons or other suitable user input interfaces. The Internet radio station may be selected using a previously defined list of favorite stations (e.g., stations that have been assigned to certain dedicated station buttons or voice commands such as "station 1," "station 2," etc.).

Detailed Description Text (303):
At step 914, automobile personal computer 14 may run appropriate decoding software to decode streaming Internet content for the selected Internet radio station while that content is being provided to automobile personal computer 14 over the remote wireless Internet link. The decoded content may be played through the sound system of automobile 12 in real time.

Detailed Description Text (304):
Wireless automobile Internet access may be subsidized if the user is provided with advertisements or other promotions, because the revenues that an Internet service provider may obtain from selling such advertisements or promotions to merchants may offset any loss in revenues from subscribers. Illustrative steps involved in using automobile personal computer 14 to provide users with subsidized Internet access are shown in FIG. 80. At step 916, automobile personal computer 14 may be used to provide the user with an opportunity to direct automobile personal computer to establish an Internet connection with an Internet service provider that offers subsidized service. At step 918, automobile personal computer 14 presents the advertisements used by the service provider to offset the costs of the subscription fee losses before Internet access is permitted. The advertisements may be audio advertisements and may have visual content if desired. At 920, the user is provided with wireless Internet access. Additional advertisements may be periodically presented to the user. For example, every 10 minutes an audio advertisement may be played that temporarily interrupts the user's ability to use the service under voice command. If desired, the user may be permitted to access the Internet using audio commands and prompts, while visual advertisements are displayed. Similarly, audio advertisements may be presented without disrupting the user, provided that the user only uses buttons or on-screen interfaces to interact with automobile personal computer 12.

Detailed Description Text (317):
Automobile personal computer 14 may be used to provide operator-assisted services. Illustrative steps involved in providing operator-assisted services to the user are shown in FIG. 85. At step 954, automobile personal computer 14 may be used to provide the user with an on-screen option, audio option, or button-actuated option that allows the user to contact the service provider (e.g., for directions or points-of-interest information, etc.). After the user selects a desired option, automobile personal computer 14 may be used to place a telephone call (e.g., a cellular or satellite telephone call) that connects the user with the service provider at step 956. At step 958, the current location of automobile 12 may be determined (e.g., automobile personal computer 12 may use GPS techniques to determine the location or other suitable location techniques may be used). At step 960, if the user is interacting with an information service or an advertisement, contextual information may be provided to the service provider, such as information regarding which point-of-interest the user is interested in, which advertising the user has selected, etc. This allows the service provider to assist the user by contacting the appropriate merchant at step 962. The service provider may make reservations, provide the user with information that helps the user to purchase products or services, etc.

Detailed Description Text (318):
Automobile personal computer 14 may be used to provide traffic reports. Illustrative steps involved in providing traffic reports are shown in FIG. 86. At step 964, after the user has taken note of the current traffic situation, automobile personal computer 14 may be used to provide the user with an opportunity to create an e-mail traffic report. For example, the user may be provided with an opportunity to speak the voice command "create traffic report" or to select a button or on-screen option. The user may then be prompted to record an audio clip report or to dictate a text e-mail using the automobile personal computer's voice-recognition capabilities.

Detailed Description Text (319):
At step 966, automobile personal computer 14 may be used to provide the user with an opportunity to e-mail the traffic report message to a traffic news service over a remote wireless link.

Detailed Description Text (320):
The traffic news service may have, for example, a remote server that automatically

processes incoming e-mail messages or that is operated by personnel who manually assist in the processing of incoming e-mail messages at step 968.

Detailed Description Text (321):
At step 970, the traffic news service may provide updated traffic information to users that reflects the information from the e-mail report (as text or streaming audio or in any other suitable format). The traffic information may be provided over the Internet, may be provided as a data service using satellite or terrestrial wireless distribution techniques, may be provided as part of a radio broadcast, or may be provided using any other suitable technique. The traffic information may be provided as text, graphics, audio, or video. If, for example, the user appends a digital still image to the e-mail, such an image may be provided to users as part of the service. The recipients of the traffic service may be located in other automobiles or may be located at any other suitable location (e.g., the home or office, etc.).

Detailed Description Text (324):
Applications running on automobile personal computer 14 may access the Internet or other suitable communications network over a remote wireless link. This may allow the applications to access additional information or more current information than might otherwise be possible. If desired, such Internet connections may allow multiple users in different automobiles and stationary locations to interact. For example, multiplayer games may be provided. In an instructional environment (e.g., with foreign language instruction or the like), students in multiple automobiles may use automobile personal computers 14 to interact with a common instructor. Students may, for example, use automobile personal computer 14 to interact with an instructor and other students using e-mail, real-time messaging, text or audio chat functions, real-time voice links (over the Internet or using telephone-type links), etc. These multiperson communications features may be used for any suitable purpose. For example, a real-time chat group may be used to discuss traffic, politics, movies, books, current events, etc. The chat server that supports the chat function may limit participation to those participants who are communicating from an automobile personal computer 14 or may include any participant with access to a computer.

Detailed Description Text (329):
Illustrative steps involved in using automobile personal computer 14 to provide a trivia game are shown in FIG. 90. Such a game may be operated in a single-player or a multiplayer format. At step 996, automobile personal computer 14 may provide the game participants with trivia questions. Players may answer verbally, if desired. For example, if the questions are provided as multiple choice questions, automobile personal computer 14 may use voice recognition to determine whether the user is responding with an answer of "a," "b," or "c." Full spoken answers may also be handled using voice recognition. If desired, answers may be supplied using buttons or on-screen options. At step 998, scores may be maintained for each player. After a certain point level is reached by one of the players, a winner may be announced through the sound system of automobile 12 at step 1000.

Detailed Description Text (331):
Steps 1002 and 1004 may be implemented locally on automobile personal computer 14, may be implemented remotely (e.g., on a remote server that is in communication with automobile personal computer 14 over a remote wireless link such as a remote wireless Internet link or the like), or may be implemented using a combination of local and remote techniques. The benefits and rewards that are provided may be provided as financial credits, discounts, products or services, etc. The benefits and rewards may be provided at any suitable location. For example, a benefit may be provided locally by providing a free download of a game or audio clip over a local or remote wireless link. A benefit may be provided remotely by crediting the user's bank account.

Detailed Description Text (336):
Local databases such as map databases and databases for points of interest and the like may be updated using automobile personal computer 14. Illustrative steps involved in wirelessly updating these local databases are shown in FIG. 94. At step 1018, the user may install a CD or DVD database in automobile 12. The database may be a map database, a points-of-interest database, etc. At step 1020, the user may be provided with an opportunity to request information from the database. At step 1022, current information for the database may be obtained over a remote wireless connection. For

example, current information may be obtained from a remote server using a wireless Internet connection. At step 1024, the current information and the information from the CD or DVD database may be provided to the user.

Detailed Description Text (343):
The user may direct automobile personal computer 14 to use different languages when using its voice-recognition and voice-synthesis capabilities. Illustrative steps involved in using automobile personal computer 14 to operate with different languages are shown in FIG. 96. At step 1038, the user may be provided with an opportunity to select a language to use for voice-synthesis operations (e.g., when reading text e-mail and the like) and to select a language to be used during voice control.

Detailed Description Text (344):
At step 1040, automobile personal computer 14 may be provided with text (e.g., in the form of e-mail, books, written memos and other documents, reports, etc.) At step 1042, automobile personal computer 14 may use the selected language when performing voice-synthesis operations on text being read to the user and when recognizing spoken voice commands from the user. For example, if the selected language is French, automobile personal computer will read all e-mail messages as if they were written in French by using a French language voice-synthesis tool. A French language voice-recognition algorithm may be used, so that the user may issue voice commands in French. Selecting the proper language to use during voice synthesis and voice recognition prevents automobile personal computer 14 from mispronouncing foreign text and allows the user to speak in their native language. If desired, a language translation program may be used to translate materials in one language into another.

Detailed Description Text (347):
At step 1048, novelty sound effects may be played through the automobile's sound system. Mock engine noises, brake noises, and tire squeals and the like may be provided. The quality and intensity of such sound effects may be related to monitored vehicle characteristics. Vehicle characteristics may be monitored using vehicle electronics 174. As an example, a mock engine noise may be provided that increases in intensity as the speed of the automobile increase, screeching brake sounds may be provided when the user depresses the brake pedal, and tire squeals may be provided when GPS signals or inertial sensors or compass sensors or the like detect that the automobile is making a turn. For realistic effects, automobile personal computer 14 may generate sound effects that are based on combinations of several such measured parameters. Engine sounds may be provided that replicate the engine sounds of famous automobiles.

Detailed Description Text (354):
Automobile personal computer 14 may provide features that help the manufacturer and dealer stay in touch with the user after the automobile has been sold. If desired, access to some of these features may be provided using front-panel buttons, as shown in FIG. 100. For example, front panel 1060 of automobile personal computer 14 may have a dedicated button 1062 labeled "auto news." When pressed, this button may direct automobile personal computer 14 to play a promotional audio segment that contains recent news from the manufacturer, such as auto show news, new models, promotional offers for the new model year, trade-in specials, etc. News on recalls may also be provided. The audio segment may be stored locally (e.g., on storage 80 or other suitable storage) or may be obtained using a remote wireless link. If the audio segment is stored locally, it may be updated over a remote wireless link. If desired, the dealer may provide the audio segment (e.g., when automobile 12 is sold to the user, during maintenance visits, etc.) The dealer may provide automobile personal computer 14 with the audio segment using a removable storage media or by downloading the segment over a physical link or a local or remote wireless link. If desired, the audio segment may be provided in a continuous loop over a radio channel (e.g., a terrestrial or satellite radio channel or data stream). The audio segment may be provided as a download or as streaming audio or as a wireless Internet link. A combination of these approaches or other suitable approaches may also be used.

Detailed Description Text (363):
Additional dedicated buttons may be provided. As an illustrative example, a button such as weather button 1072 may be pressed to receive weather information. The information may be provided over a terrestrial or satellite broadcast link, a remote

wireless link (e.g., a remote wireless Internet link), as part of a terrestrial data broadcast, or using any other suitable technique. News information may be received similarly, by pressing button 1074. If the user presses report traffic button 1076, the user may be provided with an opportunity to submit a traffic report. If desired, users may assign different tasks to different buttons, thereby customizing the buttons. Moreover, any of the options or functions provided by automobile personal computer 14 may be assigned to a dedicated or nearly-dedicated button by the manufacturer, the user, or any other suitable entity if desired.

Detailed Description Text (371):
At step 1098, automobile personal computer 14 may be used to automatically create a message containing the captured image, the license plate number (if extracted), information on the time and date at which the image was captured, information on the location of the image capture (e.g., determined by GPS or other suitable techniques), the name and the address and telephone number (e.g., the automobile's cellular telephone number) and e-mail address (e.g., the automobile's e-mail address), and any other such information. The user may modify the message before it is sent or. it may be automatically sent.

Detailed Description Text (378):
At step 1126, a user device that is remote from automobile personal computer 14 may be used to arrange for the downloading of digital audio files to automobile personal computer 14. The user device may be a personal computer, a portable computer, a handheld computing device, an in-home electronic device, a cellular telephone, or any other suitable electronic device. At step 1126, the user device is used to provide the user with an opportunity to select which audio files or other files are to be wirelessly downloaded to automobile personal computer 14. For example, a list of available audio file titles may be displayed on the display of the user device. The user may use a pointing device or other user input arrangement to select certain files for downloading. The user may, for example, click on a desired MP3 audio file using an arrow. At step 1128, the selected files are wirelessly downloaded to automobile personal computer 14 over a wireless link. For example, a selected digital audio file may be downloaded to automobile personal computer 14 from a web site or other source implemented on a server connected to the Internet or the like over a remote wireless link. The digital audio file does not need to pass through the user device.

Detailed Description Text (379):
It may be desirable to. gather information on the use of interactive audio that is provided to the user. Illustrative steps involved in gathering such information are shown in FIG. 109. At step 1130, access information may be gathered. For example, information may be gathered on what materials are downloaded by the user or otherwise received by the user. This information may include information on the content of the materials, the date and time the materials were downloaded or otherwise accessed, the location of automobile 12 when the materials were accessed, etc.

Detailed Description Text (387):
Because not all recipients of an interactive radio broadcast may have an automobile personal computer 14 with which to electronically respond to an interactive opportunity, interactive advertisements may be presented only to users with interactive equipment (e.g., automobile personal computer 14). If desired, both noninteractive and interactive advertisements may be provided with the broadcast. As an example, a satellite or terrestrial radio broadcast may be used to supply passive audio content with noninteractive advertisements. Automobile personal computer 14 may receive this broadcast while receiving interactive advertisements over a remote wireless Internet link. Both types of advertisements may be provided at the same time. Recipients without interactive equipment may be presented with the noninteractive advertisements, whereas the user at automobile personal computer 14 may be presented with the interactive advertisements by inserting the interactive advertisements in place of the noninteractive advertisements.

Detailed Description Text (392):
Service provider 1140 may communicate with personal computers such as personal computer 1142 and other computing devices and in-home electronic devices over wireless or wired communications paths (e.g., over the Internet). Service provider 1140 may provide users at such devices with web pages and other material. This material may

contain information on maintenance, promotions, advertisements, news and press releases from the manufacturers, recall information, information on sales, etc. Users may provide personal information regarding their automobiles and their automobile-related interests and the like.

Detailed Description Text (393):
Service provider 1140 may, if desired, communicate with multiple manufacturers over communications links such as the Internet, other network links, wireless links, or any other suitable communications paths. Manufacturers may supply service provider 1140 with information on new products to be promoted, news, press releases, manuals, answers to frequently asked questions, information on accessories and options for owners of existing automobiles, etc. This information may be made available to users at automobiles 1136 and 1144 and personal computer 1142.

Detailed Description Text (397):
Illustrative steps involved in providing dormant advertisements and other such promotions and material to the user are shown in FIG. 111. At step 1152, a dealer, service facility, manufacturer, the user, or other suitable entity may install dormant messages on the automobile personal computer. The message may be installed in storage 80 or other suitable storage in automobile 12. At step 1154, automobile personal computer 14 may monitor the automobile's state using various sensors such as the sensors of vehicle electronics 174. The automobile's location may also be determined (e.g., using GPS receiver 112). Any suitable sensor readings, combination of sensor readings, vehicle performance statistics, location data, etc. may be used as a trigger for the presentation of the message. For example, a message may be presented when a certain mileage is reached (e.g., to advise the user of recommended maintenance), when a certain date is reached (e.g., to advertise a yearly special on service at the dealer), when the automobile's fuel tank is low (e.g., to advertise gasoline or to simply inform the user that fuel is running low--e.g., with an audio alert), when the historical gas mileage over the last month has dropped below a certain point (e.g., to inform the user of a potential problem), when the engine begins to run hot (e.g., to advise the user to seek service), when the exterior temperature of the automobile drops below a certain level (e.g., to advertise windshield wiper fluid), when the automobile's location moves beyond a certain substantial distance from the dealer for more than a month or two, indicating that the user has moved (e.g., to promote a local dealer in the area who can serve the user), when the user passes a high mileage (e.g., 100,000 miles) or a long time has passed (e.g., 5 or 10 years) (e.g., to recommend a new automobile and to allow a user to request a brochure--e.g., by responding "yes" verbally to an audio prompt asking the user whether the user would like such a new brochure), etc.

Detailed Description Text (400):
Messages such as advertisements and notifications or any other suitable material may also be provided using e-mail or the like. For example, when an automobile is sold to a user, the dealer (e.g., dealer 1138 of FIG. 110) or manufacturer (e.g., manufacturer 1150 of FIG. 11) or the user may notify a service provider (e.g., service provider 1140). After a certain time has elapsed from the date of sale (e.g., six months), the service provider, dealer, or manufacturer may send a message (e.g., in an e-mail format or any other suitable format) to the user's automobile personal computer or home e-mail address as a reminder that recommended service is due. Messages may be sent to the user's automobile personal computer using a remote wireless link (e.g., an Internet link or the like) or using any other suitable data path. Messages sent from the service provider, dealer, or manufacturer may include text, graphics, audio, and video. They may be automatically played through the automobile's sound system and displayed on the displays of automobile personal computer 14 when they are received or at some time after they are received, or they may be displayed in a list of incoming e-mail messages or the like. The messages may include interactive content. The interactive content may allow the user to purchase products or services, schedule service visits, request information, etc. Remote or local wireless communications links may be used to initiate and consummate such transactions. The messages may be informative or commercial (e.g., advertisements) or may include a combination of such content. Any suitable condition or set of conditions may be used to trigger the distribution of such messages to the user by the service provider, dealer, or manufacturer. For example, messages may be sent when a certain time has elapsed since the sale of the automobile or since the user's last service visit.

Detailed Description Text (401):
Illustrative steps involved in providing messages such as notifications and advertisements or any other suitable material to automobile personal computers and other user equipment from dealers or other service facilities, service providers, manufacturers, and other suitable entities are shown in FIG. 112. At step 1158, the dealer or other service facility, service provider, manufacturer, or other suitable entity may obtain information regarding the user and the user's automobile. Information may be obtained on the user's address, e-mail address, automobile personal computer e-mail address and identifying information, information on the make and model of the user's automobile, information on the user's household, etc. Such information may be gathered, for example, during the sale of the automobile by the dealer, when the user fills out a warranty registration, when the user signs up for a service with the service provider, from automobile personal computer 14, etc. Information may also be obtained on the state of the user's automobile as determined using various sensors such as the sensors of vehicle electronics 174. The automobile's location may be determined using GPS receiver 112 or other suitable location arrangement. Information that includes automobile-related data and sensor data may be gathered using any suitable technique. For example, such information may be gathered by the dealer during maintenance visits, using automobile personal computer 14 to provide information to the service provider over a remote wireless link, or by the manufacturer when the user completes an on-line survey, etc.

Detailed Description Text (403):
If desired, interactive messages may provide the user with opportunities to obtain discounts. For example, a user may be asked to respond to a message within a fixed amount of time to set up a service visit. If the user responds within the fixed amount of time, the user may be awarded the discount. The user may use automobile personal computer 14 to respond to the messages by issuing voice commands, pressing buttons, or by interacting with on-screen options. The response may be communicated to the dealer, service facility, service provider, manufacture, or other entity from automobile personal computer 14 using a remote wireless link. The response may be communicated to the dealer, service facility, service provider, manufacture, or other entity from any other user device (e.g., a refrigerator-mounted web appliance or other in-home electronic device) using the Internet or any other suitable communications link.

Detailed Description Text (404):
If desired, custom driving directions may be transmitted to automobile personal computer 14 (e.g., from a computer over a remote wireless link). For example, an individual may send directions to the user describing how to get to the individual's home. The directions may contain a shortcut or unconventional route that computer-based navigational algorithms would not recommend or may contain information on landmarks that would not be included in a CD or DVD points-of-interest database. The individual's directions may be used in place of the driving directions that automobile personal computer 14 would otherwise have provided using its navigational capabilities. The voice-synthesis and off-route navigation capabilities of automobile personal computer 14 may be retained.

Detailed Description Text (405):
As another example, custom driving instructions may be sent by a company to the company's delivery trucks. Such custom instructions may involve circuitous routes calculated by complex optimization programs at the companies central facilities. Such routes may be sent to automobile personal computer 14 and played back to the user through the automobile's sound system (e.g., using voice synthesis). If, by design or accident, the driver goes off-route (i.e., the driver temporarily does not follow the driving directions being provided by the automobile personal computer), automobile personal computer 14 may use a map database (e.g., a CD or DVD map database in automobile 12 or a remote server database accessed over a remote wireless link) to recalculate directions from the driver's current location back onto the custom route. Because the custom route is provided to automobile personal computer 14, automobile personal computer 14 may display navigational directions for the custom route on displays such as a front-panel display that the driver may follow.

Detailed Description Text (406):
Because automobile personal computer 14 may use the same presentation paradigm for

custom driving directions that is used to present driving directions generated by automobile personal computer 14 from a map database (e.g., a CD or DVD database), the user may only need to master a single type of automobile navigation system.

Detailed Description Text (407):
Illustrative steps involved in using automobile personal computer 14 to handle custom driving directions are shown in FIG. 113. At step 1162, custom driving directions may be created. The custom directions may be created by an individual or a company. To ensure compatibility with the driving direction format used by automobile personal computer 14, a driving directions application may be used that is configured to supply driving directions in a format recognized by automobile personal computer 14. The driving directions application may be implemented on equipment that is located at the direction creator's home or business or may be implemented using a remote server (e.g., a server affiliated with a navigation services provider). The driving directions application may use the same map database that is used by automobile personal computer 14 during navigation. To satisfy the need for complex routing solutions for certain businesses, the driving directions application may be configured to solve complex routing problems or may be configured to work with suitable routing programs.

Detailed Description Text (411):
Automobile personal computer 14 may be provided with interactive audio using various arrangements. For example, passive audio content may be provided on one wireless path or channel or link or stream and the interactive component or portion that is associated with that audio content may be provided on another wireless path or channel or the like. If desired, the interactive component or portion may use an Internet link.

Detailed Description Text (412):
As shown in FIG. 114, for example, automobile personal computer 14 may receive audio content from a terrestrial broadcast source 1168, while an interactive component that is associated with that content may be provided using an Internet link formed with satellite 1170. The audio content that is lo received from source 1168 may be provided as a passive audio broadcast from, for example, an FM source, and AM source, a digital audio broadcast, or any other such format. The communications link formed between satellite 1170 and automobile personal computer 14 may be an Internet link or any other suitable type of interactive communications link.

Detailed Description Text (413):
In the arrangement of FIG. 115, audio content may be received by automobile personal computer 14 from satellite 1172 and an Internet link may be formed using satellite 1174.

Detailed Description Text (414):
In the arrangement of FIG. 116, automobile personal computer 14 may receive audio content from satellite 1176. An interactive Internet link may be formed using the same satellite 1176.

Detailed Description Text (415):
As shown in FIG. 117, both audio content and the Internet link may share the same communications path between satellite 1178 and automobile personal computer 14. For example, audio content may be provided as streaming Internet audio.

Detailed Description Text (416):
As shown in FIG. 118, an Internet link may be formed with automobile personal computer 14 using a terrestrial base station 1182 and audio content may be received from satellite 1180.

Detailed Description Text (417):
FIG. 119 shows how audio content may be received by automobile personal computer 14 from a terrestrial broadcast source 1184 and an Internet link may be formed with a terrestrial base station 1186.

Detailed Description Text (418):
As shown in FIG. 120, audio content may be received by automobile personal computer 14

from a terrestrial base station 1188 and an Internet link may be formed with the same terrestrial base station.

Detailed Description Text (419):
FIG. 121 shows how both audio content and the Internet link may share the same communications path between terrestrial base station 1190 and automobile personal computer 14 . For example, audio content may be provided as streaming Internet audio.

Detailed Description Text (420):
In the examples of FIGS. 114-121, the audio content that is received by automobile personal computer 14 from terrestrial broadcast sources may be provided as a passive audio broadcast from, for example, an FM source, and AM source, a digital audio broadcast, or any other such format. Passive audio content may also be received from satellites. Interactive links, which may be Internet links or any other such suitable links, may be formed with either satellites or terrestrial base stations.

Detailed Description Text (421):
Audio may be provided on any of the Internet links. For example, audio may be provided as streaming Internet audio. Interactive content may be coordinated with passive audio content. For example, an interactive advertisement to buy a particular product may be coordinated with an audio segment provided over a broadcast link providing passive audio. If desired, interactive audio advertisements and the like that are provided over an Internet link may preempt passive audio (e.g., audio advertisements) that are being provided from a broadcast source.

Other Reference Publication (1):
Copies of pages from the OnStar.RTM. website as printed from the Internet on Jan. 10, 2000.

Other Reference Publication (2):
ZDNet "The Ultimate Spy Gear--Chapter 9: Putting a Tail on Someone" (printed from the Internet on Jan. 4, 2000).

Other Reference Publication (3):
Mark Moeller, "AutoPC Power: A look at the first year with Auto PC with Microsoft" Windows CE Power Magazine (printed from the Internet on Dec. 29, 1999).

Other Reference Publication (4):
Copies of pages from the website of Clarion Corporation as printed from the Internet on Dec. 29, 1999.

CLAIMS:

12. A method for providing interactive audio content to a user in an automobile with a voice-controlled automobile personal computer, wherein the automobile has a sound system and wherein the automobile personal computer communicates with a personal computer that is external to the automobile, the method comprising: providing the user with an opportunity to control the automobile personal computer with voice commands; using the at least one remote wireless path to obtain audio content and to establish an interactive link; playing the audio content for the user through the sound system; allowing the user to use voice commands to direct the automobile personal computer to electronically purchase a product in response to the audio content; determining the location of the automobile using a global positioning receiver; and providing information on the location of the automobile to the personal computer that is external to the automobile as e-mail using remote wireless communications.

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L14: Entry 40 of 108 File: PGPB Apr 25, 2002

DOCUMENT-IDENTIFIER: US 20020049535 A1
TITLE: Wireless interactive voice-actuated mobile telematics system

Abstract Paragraph (1):
A wireless interactive voice-actuated mobile information system permits a motorist to obtain information and assistance, hands free, using voice technology and the Internet. An on-board telematics unit in a motor vehicle connects using wireless (cellular) communications with the Internet while the vehicle is underway. A G.P.S. locating circuit is coupled to the on-board telematics unit. An interactive voice-net off board station is connected via Internet to communicate wirelessly with the on-board unit. Commercial subscribers including, restaurants, hotels, etc., maintain a connection to the central station. The on-board computer communicates the geographical position and direction of travel to central station to obtain restaurant or hotel information, which the telematics unit communicates using voice technology with the person in the vehicle. The person can make and confirm lodging and communicate payment data to a selected restaurant or hotel. The system operates unattended at the subscriber end.

Summary of Invention Paragraph (2):
[0002] This invention relates to voice navigation and information systems for travelers, such as motorists or other motor vehicle operators, and is more particularly concerned with a system that can direct a motorist to a restaurant, hotel, motel, state park, retailer, or other hospitality facility, using wireless communications and the Internet. The invention also concerns telematics, i.e., hands-free automated communication of data between an on-board or in-vehicle computer device and a computer or server at a service provider.

Summary of Invention Paragraph (3):
[0003] A number of wireless motor vehicle navigation systems have been proposed, and some of these employ voice or speech technology so that a driver of the vehicle does not have to use his or her hands to communicate nor does the driver have to take his or her eyes off the road to get information.

Summary of Invention Paragraph (4):
[0004] Voice-type navigation systems for motor vehicles are described, for example, in U.S. Pat. No. 5,4406,492 to Suzuki, and in U.S. Pat. No. 5,177,685 to Davis et al.

Summary of Invention Paragraph (5):
[0005] Sulich et al. U.S. Pat. No. 5,875,412 relates to a wireless navigation and route guidance system for a vehicle, with an on-board navigation computer. The computer communicates with a central processor. The arrangement of the Sulich et al. patent relates geographical coordinates, i.e., latitude and longitude, to street addresses and phone numbers. The Sulich et al. arrangement can also dispatch routing information for a truck or fleet vehicle.

Summary of Invention Paragraph (7):
[0007] Other prior patents concern various aspects of computerized vehicular navigation. Nimura et al. U.S. Pat. No. 5,890,088 relates to a map display system. Schulte et al. U.S. Pat. No. 5,736,941 concerns a land vehicle navigation device using speech messages to communicate with the driver. Kaneko et al. U.S. Pat. No. 5,729,109 also employs voice guidance for navigation, and provides the driver with route information based on stored map data and G.P.S. positioning information. Eldridge U.S.

Pat. No. 5,717,392 concerns a vehicle direction and control system with a multi-media output that can be used as an automated tour guide. Reynolds U.S. Pat. No. 5,677,837 concerns a mobile position determination system that compares actual position with a destination position, using a "position comparator." Kishi et al. U.S. Pat. No. 5,410,486 concerns a system that employs a voice vehicle navigation system, and issues oral route guidance based on the vehicle's position and motion situation. Schuchman et al. U.S. Pat. No. 5,365,450 concerns a G.P.S.-based locator system for use in an "urban canyon" environment where there is a limited line of sight to the constellation of navigation satellites; Schuchman et al. merges G.P.S. and wireless telephone systems to obtain the 900-bit G.P.S. satellite data message over the wireless system instead of directly from the satellite.

Summary of Invention Paragraph (8):
[0008] DeLorme et al. U.S. Pat. No. 5,948,040, describes an automated trip planning system with a reservation capability, for which, in a preferred embodiment, a so-called TRIPS provider is used, which is DeLorme's proprietary third-party travel reservation service. DeLorme's process of making reservations, either from the fixed computer arrangement or from a mobile facility, is described as making reservation information and materials associated with services or goods available from one or more travel service providers which can either be a third-party provider, i.e., a travel agency, or from its TRIPS provider functionality. Requests for lodging or restaurant services are handled through a TRIPS service bureau where a third party negotiator functionality is included in between the individual in the vehicle and the target restaurant or hotel. Any follow-up dialog between the user and the hotel or restaurant is also through the TRIPS provider. That is, a third-party negotiant is involved. The person in the vehicle does not communicate over the Internet directly with the hotel (or restaurant). In addition, DeLorme does not contemplate communicating directly with the hotel or restaurant computer system, so that the service provider generates information, reservations, and confirmations automatically without human intervention at the provider end.

Summary of Invention Paragraph (9):
[0009] To date, no one has proposed a voice-actuated system that can provide the motorist with relevant information concerning hotels or restaurants in the vicinity, contact the hotel or restaurant and obtain up-to-date menu, rate, room availability, or other such information, or make a reservation at the restaurant or hotel for the motorist, and confirm the reservation automatically over the Internet. Currently, the motorist has to rely on travel guides or on-line travel services, which may or may not have the most recent information, and which may not provide accurate driving directions to reach the location of the hospitality facility. Conventionally, on-line travel services require an attendant, i.e., human interaction, at the hotel or restaurant end. Otherwise, the traveler is limited to roadside fast-food facilities and to motels that are adjacent the exits for the major highways. Also, if the traveler should need automotive repair, a repair facility be very difficult to find and it is difficult to make repair arrangements while on the road.

Summary of Invention Paragraph (10):
[0010] Telematics, i.e., transport telematics or mobile telematics, have recently come into play. Telematics employs modem telecommunications technology to assist travelers, trucking operators, or other transport operators in efficient travel, increased efficiency and productivity, and reduced driving times through optimized route selection and congestion avoidance. There has been recent interest in assisting hospitality providers in optimal pricing to achieve higher fill rates and to reduce waiting times at hotel/motel check in, for example. Ideally, telematics could provide a hotel or motel reservation and confirmation function that could be carried out directly between a hotel Internet function, through the hotel's property management system or reservation management system, and the automotive on-board computer. In such case, the system could avoid the need for attended operation, i.e., require human intervention, at the hotel end, as the entire transaction can be handled between the hotel Internet computer and the automotive on-board computer. Likewise, a Restaurant Management System, in the restaurant's Internet-connected computer, can communicate directly and unattended with the automotive on-board computer.

Summary of Invention Paragraph (12):
[0011] Accordingly, it is an object of the present invention to provide a voice

interactive wireless information system for the benefit of motorists and other travelers, and which overcomes the drawbacks of the prior art.

Summary of Invention Paragraph (18):
[0017] In accordance with one aspect of the present invention, a wireless interactive voice-actuated mobile information system employs an on-board computer installed in the motor vehicle with cellular phone service or similar wireless technology to connect to the Internet while said vehicle is underway. A voice technology circuit coupled with the computer permits the computer to communicate with a person in the vehicle, i.e., the driver or operator, and converts spoken commands uttered by the person to electronic commands to be used in the computer. A speaker and microphone are coupled to the voice technology circuit. A G.P.S. or G.B.P.S. locating device is coupled to the on-board computer and provides the computer with real time geodetic positioning information. There can be inputs connected with the speedometer and odometer, and to a compass to obtain speed, distance, and direction information.

Summary of Invention Paragraph (19):
[0018] An interactive voice net central station is connected via the Internet and communicates over the wireless system with the on-board computer in the vehicle. Meanwhile, a number of commercial subscribers are also connected, via the Internet, to the central station, and these may include a plurality of hospitality providers whose location is known relative to one or more principal roadways. Each of the subscribers maintains an Internet connection with the central station and can provide up-to-date information for the travelers that have the system installed on their vehicles. The central station has a capability for querying the on-board computer of the vehicle in question to obtain the geographical position and direction of travel of that motor vehicle. Then the central station can communicate via the voice technology circuit with the person in the vehicle to receive commands from him or her and to provide information and questions to him or her. Then the central station conveys the requested information, including any desired hospitality reservation information between one or more of these commercial subscribers and the motorist hands-free.

Summary of Invention Paragraph (22):
[0021] In this invention, a wireless interactive voice recognition, text-to-speech, speech-to-text, and/or Smartcard actuated automobile/vehicle based information, reservation booking, and point-of sale system permits a person, i.e., motorist, to identify, reserve, and purchase lodging accommodations, as well as associated meal, hospitality and travel services (i.e., restaurant reservations, amusement park tickets, airport parking, golf tee times, vehicle commerce coupons such as fuel or car wash, etc.). The transaction process for the motorist to identify, reserve, and purchase provider services are conducted in real time and hands free, or virtually hands free. Herein, lodging accommodations and associated hospitality and travel service providers are considered as "providers" or "subscribers", and the persons who operate the system can be motorists, occupants of hotel rooms, diners, or travelers, but the terms "persons" and "motorists" are intended to cover all these generally. The term "Smartcard" is used here to include other equivalent technologies as well, such as smart cell phone and PDA technology.

Summary of Invention Paragraph (23):
[0022] In this invention, as disclosed and described herein, the vehicle on-board computer serves as the vehicle's telematics unit, with interactive voice recognition for actuation of the off-board computing system at the central or control station, with features such as speech-to-text, text-to-speech, Smartcard, Personal Digital Assistant (PDA), Global Positioning Satellite (GPS), ground-based positioning system (GBPS), and associated input media. In-vehicle input-output channels can be connected to the telematics unit either through an integrated circuit, wireline connection, and/or short wireless connection (such as Bluetooth). Smartcard refers to card media, typically compliant with American Banking Association (ABA) credit-card design standards, and which is embedded with a processing/storage microchip. The Smartcard can be utilized independently, or in connection with another card technology such as magnetic strip, bar code, and/or proximity, i.e., as a multi-media card. The system connecting the off-board and subscriber facilities can include wirelines, wireless systems, the Internet, software, electronic hardware, network circuits, i.e. WANs and LANs, and includes the databases necessary to execute the input, processing, and output of commands and data. The invention may employ multiple input and output

channel options that provide motorists with the flexibility to select system operating preferences to create a personalized, hands-free or virtually hands-free, human interface with the system.

Summary of Invention Paragraph (24):
[0023] A vehicle that is underway and is equipped with a telematics unit of this invention, i.e., with the associated circuitry and devices for input, processing, output, and display of information and/or data, allows the motorist to connect to the Internet using wireless communication technology. A coupled interactive voice recognition circuit converts spoken commands uttered by the motorist to electronic commands that are processed by the telematics unit to actuate the unit and off board computing system. A coupled GPS or GBPS circuit supplies location data that are processed by the telematics unit and transmitted to the off board computing system. Coupled auxiliary devices or circuits allow Smartcards, PDAs, smart cell phones, and/or a printer to be linked via wireline or short-range wireless with the telematics unit to aid the motorist in the inputting, receipt, storage, and retrieval of information. A coupled cell phone circuit provides a wireless two-way communication connection between the telematics unit and the off board computing system. The connection is established via a wireless application gateway network device and a wired Internet connection that can process both voice and electronic data commands. The off board computing system application server and message queuing feature manages voice-to-speech, as well as text/graphic, geonavigation, Smartcard, wireless interface, central reservation system (CRS) interface, and consumer/client information input functions. An application protocol adapter (APA) network device connects the off board computing system to the provider's electronic proprietary central reservation system. The necessary provider services information, data (e.g., room rate), reservation booking software, and point-of-sale software resides on the provider's proprietary central reservation system.

Summary of Invention Paragraph (27):
[0026] Other providers may be equipped with Smartcard, PDA, and/or smart cell phone enabled transaction systems, permitting them to complete point-of-sale transactions at their establishments. The providers can log into the system's server via the Internet to continuously update their respective database(s). For example, a lodging provider can continuously update a description of accommodations, room availability, standard room rates, vehicle commerce specials, discount coupons, special instructions, and advertising/marketing messages. For example, restaurants can provide menus, vehicle commerce specials, and advertising marketing messages. The system's advertising message feature will enable providers to create marketing alliances with other providers in a given geographical area, and to have advertising messages delivered with a response to a request for information and booked reservation and/or point-of-sale transaction confirmation.

Summary of Invention Paragraph (28):
[0027] Consumers, including travelers, motorists, etc., can log into the system's server via the Internet to create a personalized consumer preference profile. For example, the consumer can specify a preferred lodging company, restaurant system, attraction, gasoline brand, etc. The consumer preference profile and service provider databases may be relational so that only preferred information will be transmitted to the consumer's vehicle. Consumers can select on-demand or tracking modes when traveling. On-demand mode will only deliver provider information when requested by the motorist. Tracking mode will continuously and automatically deliver geographically specific information as the motorist is traveling (this can be personalized to the consumer preference profile).

Summary of Invention Paragraph (29):
[0028] The wireless interactive voice recognition, text-to-speech, speech-to-text, and/or Smartcard actuated automobile/vehicle based information, reservation booking, and point-of-sale system can be deployed nationwide, and even globally or internationally. To accomplish international deployment, the data input and output channels can be multi-lingual-enabled. The system preferably employs an "open" architecture and standards, so data can be exchanged and synchronized (uploaded/downloaded) with desktop, laptop, pocket, and palm classes of computers, including personal digital assistant devices (PDAs) and Internet-enabled cell phones.

Summary of Invention Paragraph (30):
[0029] Other advantages are possible, which ensue from the direct Internet connection between the Internet-connected computer at the lodging provider, for example, and the automotive on-board telematic computer. With this system, the hotel or other lodging provider can now provide the arriving motorist with a room number for the assigned hotel or motel room, so the motorist can proceed upon arrival directly to his or her room. This allows the motorist, who may be fatigued, to avoid waiting in line at the front desk. It also permits the hotel, using available technology, to provide a room-key code so the on-board computer may create a card room key, e.g., through an associated Smartcard or mag-card device. This device may be easily miniaturized to fit in the car's dashboard. The room keycard creation process may be accomplished in real time or very near real time, so that the hotel can make and confirm a room reservation and then create a room key card for the motorist even as he or she is arriving at the hotel. Also, credit card information, necessary for reservation purposes, can be exchanged directly between the motorist and the hotel, and is not shared with the Internet central station or off-board facility. The motorist's credit card information can be stored in the vehicular on-board computer, or else the motorist can simply swipe the card through a card reader in the vehicle. The credit card information does not need to be stored at a third-party location, such as with a travel agent or a TRIPS provider, as is done in some earlier systems, which require human intervention. This minimizes the possibility of compromise of the motorist's credit information, and of Internet credit-card fraud, e.g., "hacking".

Summary of Invention Paragraph (31):
[0030] Another advantage of the system of this invention is that the hotels or other participating service providers can communicate up-to-the-minute room availability and price structure, which may vary during the day depending on the hotel's fill rates, last-minute cancellations, and other factors. That is, by using a pricing program that takes into account the time of day, number of unsold rooms, vehicular traffic density, and other factors, the lodging provider can change room prices in real time to optimize the hotel room fill rate. The rates can change on a real-time basis, and can then be immediately made known to travelers in the vicinity via the on-board telematic system. This also ensures that the traveler is presented with a fair competitive room rate. Importantly, because there is no "middle-man" involved at this stage, there is no commission, which is usually a percentage of the room charge. With the conventional third-party travel reservation system, the tariff added by the third party provider would limit the flexibility of the hotel, motel or other lodging provider in filling rooms, as the hotel would not be able to offer really low, competitive rates for soon-arriving Internet travelers. By contrast, in the system of this invention, the hotel, lodging provider or other hospitality provider facility is a subscriber, and can participate, for example, for a fixed monthly fee. The central station, i.e., off-board server is not involved in negotiating or confirming a reservation, as that is carried out directly between the subscriber hospitality facility and the traveler in the vehicle. Once the interactive voice net central station, i.e., off-board server, has connected the hotel computer to the automotive on-board telematics computer, the two ends, i.e., the motorist and the lodging provider, make their transaction directly.

Detail Description Paragraph (4):
[0040] A wireless, i.e., cellular phone service system 16 connects with the motor vehicle 10, here by means of antenna towers 18 positioned at points along the thoroughfare 12, ideally, so that the vehicle is always within range of a tower. In this case the wireless service 16 connects to an Internet provider 20, which connects the motorist in the vehicle 10 to the global computer network, known as the Internet, including a central station 22 that provides interactive voice mobile information to the motorist, over the Internet. A number of commercial or other hospitality service providers, such as hotels and restaurants, and other service facilities such as parks, theaters, automotive repair facilities, etc., may also be subscribers to the interactive voice net through the central station 22. Here, a number of facilities are shown in the vicinity of an exit or crossroads 24 in the direction the vehicle is heading along the thoroughfare 12, in this example, a restaurant 26, a hotel or motel 28, and an automotive repair shop 30. Each of these subscriber locations is connected via the Internet 20 to the central station 22, and each one provides up to the minute information about its services and prices.

Detail Description Paragraph (5):
[0041] FIG. 2 shows the interior arrangement of the vehicle 10, in which an on-board telematics unit 32 fits compactly into a space in the vehicle dash near the radio/tape/CD player, and is connected to audio transducers including a microphone 34 to pick up the driver's voice, and a speaker 36. As shown in FIG. 3, the on-board telematics unit 32 includes an audio circuit, i.e., an audio card, that connects with the audio transducers 34, 36, voice technology 40, and a dedicated on-board computer 42 that is capable of Internet access. The voice technology may be a voice circuit or card, or alternatively may consist of software within the computer 42. As also shown here, a G.P.S. circuit 44 obtains satellite positioning data and feeds that to the computer 42. Sensor inputs 46 connected with the speedometer, odometer, and compass provide the computer 42 with input data about the location, speed, and bearing of the vehicle 10. A modem 48 connects the computer 42 with a cellular phone module 50 that connects with the cellular or wireless network 16 through an antenna 51 on the vehicle. A printer 52 can print out information, such a directions to one of the hospitality facilities, if the driver commands the computer to print. As also shown, the on-board telematics unit can be coupled to a card read/write module 53, which can favorably be a Smartcard device. This module can be miniaturized to fit into the dash or console of the vehicle. A Smartcard can be inserted into the module 53, to permit readout of data on a microchip embedded in the Smartcard, and to permit data to be written onto the Smartcard. Alternatively, the module 53 may be a magnetic card read/write device for writing encoded data onto a magnetic stripe of a standard mag-stripe card. This device may also be used for entering the motorists credit card account information into the on-board computer. In either case, the Smartcard or magnetic stripe card can be encoded with hotel room key code information, so that the on-board computer may create a room key for the motorist, thus avoiding delays associated with hotel or motel check-in. In some preferred arrangements, the printer 52 may print out a coded PIN number for room entry, or may print out a slip with a bar coded symbol for that purpose. An optional LCD screen 55 may be included as an output to display map or information about the subscriber hospitality provider. This may be touch screen technology to permit motorist (or passenger) input of data.

Detail Description Paragraph (7):
[0043] The operator of the motor vehicle speaks, in normal voice tones, into the microphone 34, to address the computer, i.e., "Computer, where are we?" or "Computer, what is our location?" and the on-board computer 42 will retrieve location data, or obtain fresh satellite data, and will respond to the operator, for example, "You are proceeding northbound on Interstate 99, five miles from Exit Twelve." Some of this data may be obtained from the central location over the Internet. Then the system will make a voice query to the operator, "Can I get you anything else?" and if the operator says "No, thank you," the system will go to idle and await further need. However, if the operator says "Yes, please" the computer will respond, for example, "Would you like a restaurant or hotel?" and then the operator says "Hotel" or "Restaurant." Then the computer 42 will obtain a list of local hotels within some predetermined driving distance from the present location, e.g., within the next one or two exits on the Interstate. This can be obtained via the Internet connection to the central station 22, which maintains a list of hospitality facilities, which are classified in terms of location, type of cuisine, etc., for restaurants nationwide. Based on the vehicle's location and direction of travel, data for several nearby restaurants are downloaded to the on-board computer 42. Then the computer may ask, "Would you prefer, Italian food, Chinese food, Mexican food, or American?" depending on the types of restaurants in the vicinity. If the operator states "Mexican" then the computer reads the names of one or more Mexican restaurants. If the restaurants are subscribers to the service, then they may have their full menus, prices, and other information available. However, for non-subscribers, only the name of the restaurant, general information, and location may be available. The computer then would ask "Would you like a menu?" and can list the specials and regular menu items, plus prices. The computer then may ask "Would you like me to make a reservation?" and if the operator states "Yes, please," the computer 42 will connect with the restaurant, via the Internet, and make a dinner reservation, using an estimated time of arrival based on the vehicle's location, and the driving time to the restaurant location. Then, the restaurant will confirm the reservation electronically, and the computer will give the operator a confirmation of the dinner reservation: "Your reservation is confirmed at Pancho's Restaurant at 7:00 PM. Would you like driving directions to Pancho's Restaurant?" If the operator says, "Yes, please," the computer 42 provides driving directions from the nearest exit to

the restaurant location. These are provided in voice form, but if the driver says, "Please print," the computer 42 will command the small onboard printer 52 to print out the driving directions to the restaurant. The printed instructions are useful if there is a passenger as well as the driver. With this system, the selection of available restaurants is considerably broadened for the traveler. The choice is not limited to fast-food locations at or next to the highway exits. Restaurants can offer their services to travelers even if not located nearby. Also, some restaurants may offer a special price for Internet customers.

Detail Description Paragraph (8):
[0044] This system also greatly facilitates finding lodging for the traveler. The single hotel 28 shown in the drawing represents a number of hotels and motels that may be within some reasonable driving distance of the vehicle's location. The hotels may be individual or independent hotels, or may be part of a hotel corporation or franchise. Each of these hotels would be connected via the Internet to the central station 22, and each of them would make available current up-to-the-minute lodging availability and pricing, accommodation details, special offers, and the like. The traveler can then choose from a number of providers, and can find accommodations without having to stop and hunt. The voice commands and responses for hotel selection are similar to those described above for restaurants. The system of this invention eliminates the need of making several stops to find last-minute accommodations. On the other hand, each of the hotels and motels makes its services available to a broader range of participating motorists, and thus increases the probability of filling its room vacancies. Additional information may be exchanged with the restaurant as well, such as seating preference, and number of diners in the party.

Detail Description Paragraph (11):
[0047] Within the automobile or other vehicle system 10 are various input functionalities associated with the on-board automated telematics and multi-media unit 32, including a Voice One input for controlling the automotive on-board computer 42, a Voice Two input for communicating with the off-board server, a geo-data unit such as GPS or GBPS, a Smartcard (SC) device 53, and connections for a PDA and cell phone. There are also output functionalities 100, including voice or speech, text, graphics, navigation, Smartcard, PDA and smart cell phone.

Detail Description Paragraph (12):
[0048] The telematics unit 32 connects wirelessly to carry voice and data between the unit 32 and a wireless communication protocol adapter 201 at the off-board computing facility or central station 22. This connects with an application server and message queuing (MQ) functionality 202, including voice/speech, text/graphics, geo/navigation, Smartcard interface, and storage of client (subscriber) information and consumer (motorist) information. The consumer information can include customer profiles that are entered by the consumer through Internet access, and can include preferences as to hotel chains, types of restaurants, etc., which facilitates locating and obtaining meals and lodging en route. The hotels, restaurants, and other subscribers and commercial participants can update their own profiles also, although specifics such as menus, room availability, and real-time pricing is usually carried out at the subscriber facility. An application protocol adapter 203 connects, here with a permanent wired data connection, between the application server 202 and the automated computer facility at the subscriber location 28, here represented as a Central Reservation System or CRS 280. The CRS can be associated with a hotel or group of hotels, airline or airport, or restaurant. The CRS 280 can access other data sources associated commercially or geographically with the hotel properties, e.g., shopping, entertainment (movies, theater, etc.), recreation, parking, fuel and vehicle repair, banking, and other similar businesses. The hosting hotel will typically update its CRS 280 on a daily basis or more frequently, and can update on a real time basis as to room availability and pricing.

Detail Description Paragraph (17):
[0053] If the motorist is in need of automotive repair services while en route, they may be obtained, with the selections being made on the basis of location, availability, make of automobile, and so forth. In this case, if the motorist says, "Computer, I need a mechanic," the system will find a list of the nearest available garages, car dealers, and repair shops. The repair shop can be automatically contacted via Internet, and can be provided with the vehicle's estimated arrival time, plus any

diagnostic information that can be obtained from the vehicle's on-board diagnostics equipment. The garage computer make scheduled repair arrangements automatically with the vehicle which en route, and also may be able to order automatically any needed replacement parts for the specific vehicle, so that the parts are on hand when the vehicle arrives. This keeps down time to a minimum for the traveler. In the case that roadside assistance is needed, the repair service may be provided with the identity and location of the vehicle, and may reply back with the identity and expected arrival time of the emergency road service provider. Insurance or other payment information may be exchanged automatically, as well, to facilitate getting the motorist underway.

Detail Description Paragraph (20):
[0056] Not only restaurants, hotels, and garages, but other providers may also advertise and offer information over this system. This may include shopping malls, theme parks, special attractions, state parks, beaches, and golf courses. The need for unsightly billboards could be eliminated. Real estate over a wider radius from thoroughfare exits would increase in value. Travelers would have less concern about reaching a particular exit by a given time in order to find lodging or meal services, and this could lead to less erratic and safer driving. Also, the travel directions to a restaurant, hotel, or other attraction will be of better quality than what is obtained though local advice. The driver or operator can keep his or her hands on the steering wheel and his or her eyes on the road, since all communication can be carried out by voice by means of the onboard computer and the wireless Internet connection. Vendors can be connected on a regional, nationwide or worldwide basis through a computerized system capable of handling a great load of traffic and handling it and routing it efficiently. Revenue sources may be by monthly subscription by the motorist, listing and advertising charges to the subscriber hospitality providers, and through software sales and technical support.

CLAIMS:

1. Wireless interactive voice-actuated mobile information system, comprising an on-board computer installed in a motor vehicle and including wireless means for connecting to the Internet while said vehicle is underway; a two-way voice technology circuit for communicating with a person in said vehicle and for converting spoken commands uttered by the person to electronic commands to be fed to the computer; at least one audio transducer coupled to said voice technology circuit; and a positioning and locating circuit coupled to said on-board computer; and an interactive voice net central station connected via the Internet to communicate over said wireless means with said on-board computer; a plurality of commercial subscribers including a plurality of hospitality providers whose location is known relative to one or more principal roadways; each said subscriber having an automated computer facility maintaining an Internet connection with said central station; means for querying said on-board computer to obtain the geographical position and direction of travel of said motor vehicle; means for communicating via said voice technology circuit with the person in the vehicle to receive commands from him or her and to provide information and questions to him or her; and means for communicating hospitality reservation information over the Internet directly between one or more of said commercial subscribers and said person, hands-free, in said vehicle; and wherein each said subscriber automated computer facility includes means for supplying said hospitality reservation information to said person automatically and unattended, so that human interface at the subscriber is avoided.

2. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said commercial subscriber includes at least one restaurant on whose automated computer facility is stored a digital menu including a list of food menu items and associated prices in a form that can be communicated automatically over the Internet, and said on-board computer includes means for announcing to said person via said voice technology circuit said menu items and prices.

3. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said commercial subscribers include at least one lodging provider, with said lodging provider having its automated computer facility directly connected, over the Internet, via said central station, to said on-board computer, and said automated computer facility includes means to provide said person in the vehicle directly with lodging availability and pricing in real time.

4. The wireless interactive voice-actuated mobile information system according to claim 3, wherein said automated computer facility includes means for automatically updating a room pricing schedule at said lodging facility, wherein prices for lodging space are automatically adjusted to optimize fill rate at said lodging provider.

5. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said on-board computer is selectively operable in an on-demand mode and in a tracking mode, wherein in the on-demand mode the central station provides data from said subscribers only upon a request initiated by said person, and in the tracking mode the central station automatically and continuously delivers data from subscribers in the geographical area in which the person in the vehicle is traveling.

6. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said central station also maintains a listing of non-subscriber hospitality providers, and makes available to the person in the vehicle only the name, location, and type of such non-subscriber hospitality providers.

7. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said central station provides the person in the vehicle with names and driving directions to one or more of said hospitality providers that are located within a predetermined driving distance from the location of said vehicle.

8. The wireless interactive voice-actuated mobile information system according to claim 7, wherein said central station provides said person with hospitality reservation confirmation at a selected one of said hospitality providers.

9. The wireless interactive voice-actuated mobile information system according to claim 7, wherein said hospitality providers are classified in said central station according to type and said central station queries said person concerning a selection of the type of hospitality provider, accepts a voice selection of the type of provider, and then provides the person with the names and locations of the hospitality providers of that selected type.

10. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said on-board computer includes input means coupled to speed, distance, and direction sensors in said motor vehicle.

11. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said on-board computer includes voice-actuated printer means capable of printing out information concerning said one or more hospitality providers.

12. The wireless interactive voice-actuated mobile information system according to claim 1, further including means for contacting an emergency road service provider, over the Internet, and means for providing the emergency road service provider with the identity and location of said vehicle, and means for communicating to said person in the vehicle the identity and expected arrival time of such emergency road service provider.

13. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said on-board computer includes means for creating a coded room key card for said person in the vehicle based on reservation information provided thereto in real time by a selected one of said hospitality providers.

14. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said commercial subscribers include at least one lodging provider, with said lodging provider having its automated computer facility directly connected, over the Internet, via said central station, to said on-board computer, and said automated computer facility includes means to provide said person in the vehicle directly with room key coding data in real time so that the person can proceed directly to the space reserved for him or her at the lodging provider.

15. The wireless interactive voice-actuated mobile information system according to claim 1, wherein said on-board computer stores credit card data for the person in the vehicle so that credit-card transactions can be carried out automatically with a

selected one of said subscribers; but said credit card data are not stored at the interactive voice net central station.

WEST

Generate Collection Print

L14: Entry 7 of 108 File: PGPB Apr 3, 2003

DOCUMENT-IDENTIFIER: US 20030065427 A1
TITLE: METHOD AND DEVICE FOR INTERFACING A DRIVER INFORMATION SYSTEM USING A VOICE PORTAL SERVER

Abstract Paragraph (1):
System for interfacing a device onboard a vehicle and a voice portal server external to the vehicle including a voice communicator and a data communicator situated in the vehicle. The onboard device communicates electronically with the voice communicator and/or the data communicator which in turn are able to communicate wirelessly with a base station. The base station communicates electronically with the voice portal server. A method of providing information to an occupant of a vehicle includes providing a voice communicator, a data communicator, an onboard device, a base station, and a voice portal server. The voice portal server communicates electronically with the base station, the base station communicates wirelessly with the voice communicator and/or the data communicator, and the onboard device communicates electronically with the voice communicator and/or the data communicator. The occupant communicates a request for information via the voice communicator and via the base station to the voice portal server. The voice portal server communicates an information match via the base station and via the data communicator and/or the voice communicator. A vehicle navigation apparatus including a voice communicator, a data communicator, and an onboard device situated in a vehicle. The onboard device is electrically coupled to the voice communicator and the data communicator and communicates wirelessly with a base station which electronically communicates with a voice portal server to provide information to the occupant of the vehicle.

Summary of Invention Paragraph (2):
[0002] The present invention generally regards interfacing a driver information system using a voice portal server. More particularly, the present invention regards a method and system for using a voice channel and a data channel linking an onboard device to an offboard voice portal server for the purpose of obtaining navigation information and other information.

Summary of Invention Paragraph (4):
[0003] There is an increasing effort to make Internet access available for a mobile user. There are also concerns about distracting a driver with information overload. Although there are many safety guidelines for driving, one minimal requirement is "hands on the wheel, eyes on the road." This rule suggests the use of speech to interact with information systems. Many developers have pursued voice-enabled systems, however there have been no break-throughs and costs remain high and in many cases quality remains low due to poor recognition rates and/or small vocabularies. Poor recognition rates are due in part to the enormous vocabularies which need to be recognized. For example, a navigation system must be able to recognize any given address as input, which can lead to several tens of thousands of words. The handling of this large database requires large computational power in each mobile unit which leads to significantly higher costs. Besides the high costs, the information accessible through those kinds of stand-alone systems is only as accurate as the information actually stored within the unit. The mobile unit may not be able to be updated frequently with changes like traffic situations, constructions sites, restaurants opening/closing, etc. Therefore, stand-alone systems necessarily suffer some degree of inaccuracy.

Summary of Invention Paragraph (5):

[0004] Several voice-based services on the market offer Internet-based content over the phone, for example BeVocal.com and TellMe.com. These Voice Portal services are completely automated. The user is guided to the information by following a voice dialogue, i.e. the Voice Portal offers choices the user can access using keywords. Accessing a Voice Portal requires only a phone. All the processing, such as speech recognition, content processing, and text-to-speech conversion will be done on a dedicated server at a service center. This server will not only supply the voice interface but also serves as a gateway to the Internet with its concurrent, up-to-date information. In addition, it is easy to switch to the language in which the user is most comfortable. Even within an ongoing dialogue, it is possible to switch languages due to the potential power of the Voice Portal server and the potential extent of the Voice Portal database.

Summary of Invention Paragraph (6):
[0005] However, using a Voice Portal server from a mobile unit may still be limited by the use of a single voice channel to communicate both voice and data. What is needed is a method for efficiently providing a high quality voice recognition system for a user, exporting data from onboard systems, transferring data to onboard systems, and communicating audible information to the user, all within a user interface that quickly and seamlessly responds to the user's queries and responses.

Summary of Invention Paragraph (10):
[0008] A vehicle navigation apparatus includes a voice communicator, a data communicator, and an onboard device which are all situated in a vehicle. The onboard device is electrically coupled to the voice communicator and the data communicator and communicates wirelessly with a base station. The base station electronically communicates with a voice portal server. The apparatus provides navigation information and other information to the occupant of the vehicle.

Brief Description of Drawings Paragraph (2):
[0009] FIG. 1 illustrates diagrammatically a method of coordinating an onboard voice recognition system and an offboard voice portal server system within a mobile device.

Brief Description of Drawings Paragraph (6):
[0013] FIG. 5 is a schematic representation of an embodiment of the navigation system of the present invention showing the vehicle and the system external to the vehicle.

Brief Description of Drawings Paragraph (7):
[0014] FIG. 6 is a schematic representation of an embodiment of the navigation system of the present invention showing the system internal to the vehicle.

Brief Description of Drawings Paragraph (8):
[0015] FIG. 7 is a flow chart demonstrating the method according to an embodiment of the information/navigation system of the present invention.

Brief Description of Drawings Paragraph (9):
[0016] FIG. 8 is a flow chart demonstrating the method according to another embodiment of the information/navigation system of the present invention.

Detail Description Paragraph (2):
[0017] The present invention is directed to the combination of a mobile unit comprising speech recognition for command and control and a voice portal server situated at a service provider. While ordinary command and control functionality of a car infotainment (infotainment=information and entertainment) device includes a very limited vocabulary, some applications might also require larger vocabularies (for example navigation applications including almost innumerable address entries, extensive personal address books, etc.). Also, the functionality of an infotainment system won't change over time, however roads, addresses, and Points-of-Interest (i.e. restaurants, gas stations, service stations, etc.) will definitely change. Therefore it makes sense to split voice-enabled functionality into basic command and control functions (available onboard) and application-based functionality (available on a powerful off-board server).

Detail Description Paragraph (3):
[0018] FIG. 1 shows schematically an exemplary embodiment of the dialogue structure.

Onboard speech recognition is provided for command and control (for selecting and controlling the service, for example, navigation, music, and information) and off-board speech recognition is provided for other applications (i.e. NYSE: all stock symbols; destination input: all addresses). Onboard voice recognition for command and control functions is possible in part due to the limited vocabulary necessary to operate the onboard device. This limited vocabulary requires less processing power and less expensive software to implement a voice recognition system. Maintaining command and control functions completely onboard increases the responsiveness of the onboard devices by eliminating dependence on a wireless link in the operation of the device. Off-board speech recognition for other applications is advantageous due to the large number words that must be recognized. An almost limitless number of words and numbers must be recognized by a navigation system using voice inputs for place names. Therefore, an off-board voice recognition system (for instance utilizing a voice portal server) might be utilized to enable a voice input navigation system. These two categories of functions (command/control and other applications) might be seamlessly integrated at the user level so that the occupant would not realize which voice inputs are processed onboard and which are processed offboard.

Detail Description Paragraph (4):
[0019] FIG. 1 shows a dialogue structure which is initiated in Box 5, which may represent activation of a PTT (Push-To-Talk) button, or may alternatively represent a handsfree command word activating the mobile unit (e.g. "Car, . . . "). Main Menu 7 is divided in this exemplary embodiment into Keywords 10, 11, and 12. As noted by the arrow extending off to the right from Main Menu 7, either more or fewer keywords may be represented in Main Menu 7. Keyword 10 in this exemplary embodiment accesses a radio function. Keyword 11 in this exemplary embodiment accesses a CD function. Alternative music functions available through Keywords 10 and 11 may include a cassette, CD magazine, MP3, or any other device or combination of devices for playing music. Keyword 12 in this exemplary embodiment accesses a navigation function which may therefore utilize any number of different navigation devices including but not limited to GPS (Global Positioning System), DGPS (Differential GPS), AGPS (Assisted GPS), cell phone-based positioning, satellite navigation, or any other navigation device or combination of navigation devices. Alternatively, different functions may be available through Keywords 10, 11, and 12, or additional keywords may be accessible, as indicated by the arrow extending off to the right above Keyword 12. An alternative or additional keyword may access an information function which may provide a variety of information to the driver in either text, image, or audible format. The information provided through an information function may include news, stock reports, weather, traffic updates, construction reports, or any other type of information desired. Each of Keywords 10, 11, and 12 may be recognizable by the mobile unit (not shown). The fixed number of Keywords 10, 11, and 12 available in Main Menu 7 enable a voice recognition system to be implemented in the mobile unit in a cost effective manner.

Detail Description Paragraph (6):
[0021] Keyword 11 may access functions (not shown) in Submenu 8, which may in turn access commands (not shown) in Subsubmenu 9. In this exemplary embodiment, in which Keyword 11 utilizes a CD function, functions in Submenu 8 for Keyword 11 may include onboard voice recognition systems (not shown) for command and control functions (e.g. "play CD", "track 6", "volume up", etc.). Alternatively, Keyword 11 may be operable by buttons and dials alone in a similar fashion to traditional automobile CD systems. In alternative exemplary embodiments, Keyword 11 may utilize an online music file storage and retrieval program. Functions in Submenu 8 for Keyword 11 may therefore access offboard voice recognition systems (not shown) for other music commands (e.g. "play song X", "play album Y", etc.).

Detail Description Paragraph (7):
[0022] Keyword 12 may access Functions 16, 17, and 18 in Submenu 8 through Box 5. In this exemplary embodiment, in which Keyword 12 utilizes a navigation device, Functions 16 and 17 represents different settings for Keyword 12 and may include any number of different command and control functions for a navigation device, including but not limited to positioning mode, navigating mode, zoom-in, zoom-out, overhead view, driver perspective, map, or any number of other preprogrammed functions. Functions 16 and 17 may access a voice recognition system onboard the vehicle due to the limited vocabulary necessary to operate the different preprogrammed functions available in Functions 16 and 17. Function 18 accessible through Keyword 12 may represent a

destination input function. Function 18 accesses Voice Portal Access 6 when going to the level of Subsubmenu 9. Voice Portal Access 6 accesses a voice portal server (not shown) for offboard voice recognition. This server-based voice recognition system is necessary due to the large vocabulary needed to identify an address or place that is verbally input. Accessible through Function 18 and Voice Portal Access 6 may be Commands 22, 23, and 24. Command 23 may be, for example, an address command, which may provide the address for any residence or business name input by the occupant. Command 23 may be, for example, a POI (point of interest) command, which may provide points of interest in the vicinity of the user or in close proximity to the selected route of the occupant. Command 24 may be, for example, a command which accesses recent locations or recent searches conducted by the occupant. In this way, the occupant might be able to keep a log of common destinations and thereby access the most efficient route to a familiar destination from an unfamiliar location, or alternatively, the most efficient route taking into account local traffic and construction conditions. Alternative embodiments of these commands available on Subsubmenu 9 accessing a voice portal server are also possible. Additional commands might also be available through Function 18, as indicated by the arrow extending off to the left above Command 22.

Detail Description Paragraph (8):
[0023] Alternative keywords in Main Menu 7 may include an information keyword (not shown). An information keyword may access a weather function in Submenu 8, which may in turn access an offboard server for recognition of various place names and numerous weather inquiries (e.g. "What temperature is it in London?", "What is the average rainfall in July in San Diego?", etc.). Additionally, some weather inquiries may be recognized by an onboard voice-recognition system (not shown) for locally available information (e.g. "What is the temperature outside?", etc.). An information keyword may also access a financial information function in Submenu 8, which may in turn access an offboard server for recognition of various company names and different investment data (e.g. "What is the current price of company Z?", "Which mutual funds hold stock in company Z?", etc.).

Detail Description Paragraph (11):
[0026] An example of this scenario could be as follows. User 29 wants to go to a restaurant. User 29 activates the onboard function "Information" of Mobile Unit 28 by asking for "information." Mobile Unit 28 recognizes the command and control function "information" with an onboard voice recognition system and responds to User 29 with an autoreply asking "what type of information?" When User 29 responds to the autoreply by saying "restaurant information," Mobile Unit 28 recognizes the need to access the off-board voice portal server and calls seamlessly Voice Portal 27 and forwards User 29's request for "restaurant information." Voice Portal 27 guides User 29 through Dialogue 31 resulting in Result 32, which is a particular restaurant. Voice Portal 27 gives as Result 32 the name and address of this restaurant back to Mobile Unit 28. This information may simply be delivered audibly to User 29, or may also be given as a position in electronic form to a navigation device within Mobile Unit 28. Mobile Unit 28 may therefore be able to provide more information to User 29 by combining the electronic position data for the restaurant with the current position data for the vehicle (e.g. distance, estimated travel time, directions). If User 29 decides to fill up the car en-route, Mobile Unit 28 again utilizes Voice Portal 27 to find a gas station on the route. Voice Portal 27 may then use a current position transferred from the navigation device within Mobile Unit 28, along with the destination position (either stored from the recent dialogue or also transferred from Mobile Unit 28), and the request as recognized in the off-board voice recognition system (e.g. "Find a gas station enroute") to determine the best gas station on the route. This gas station request may also be qualified in any number of ways (e.g. "Service station brand A," "Cheapest gas," "gas station closest to the highway," "gas station closest to the destination," etc.) Voice Portal 27 then gives back the name and address of the gas station, again either purely audibly or both audibly and electronically to the navigation device of Mobile Unit 28. Mobile Unit 28 may then calculate a new route based on the electronic position of the requested deviation.

Detail Description Paragraph (13):
[0028] FIG. 3 shows a combined voice and data dialogue. Mobile Unit 28 initiates a dialogue with Request 30 over Data Channel 34. Request 30 includes, for example, the kind of service desired by User 29 and the GPS position. Voice Portal 27 starts

Dialogue 31 with User 29 over Voice Channel 33 to evaluate Request 30. When Dialogue 31 has led to Result 32, Dialogue 31 finishes, and Voice Portal 27 sends Result 32 in the form of data to Mobile Unit 28 over Data Channel 34.

Detail Description Paragraph (14):
[0029] An example for the scenario shown in FIG. 3 could proceed as follows. User 29 wants to go to a movie theater. User 29 pushes a button of the driver information system, which sends Request 30 (for example using GSM-SMS or any other system providing a data channel) to Voice Portal 27 over Data Channel 34. Request 30 includes the kind of service (e.g. "Search for movie theaters") and the GPS position of Mobile Unit 28. After receiving the data, Voice Portal 27 starts Dialogue 31 in order to find out the exact user desire (e.g. "What kind of movie").

Detail Description Paragraph (15):
[0030] Since Voice Portal 27 has received the GPS position included in initial Request 30, Voice Portal 27 does not need to ask for the current user position from User 29. After Dialogue 31 results in a set of data (i.e. name and address of selected movie theater), Voice Portal 27 finishes Dialogue 31 and sends the data in the form of Result 32 over Data Channel 34 to Mobile Unit 28. Since Result 32 includes an electronic data position of the movie theater, the onboard navigation system within Mobile Unit 28 can calculate a route and start route guidance.

Detail Description Paragraph (17):
[0032] During Dialogue 31, it is possible to send Information 37 corresponding to the status of Dialogue 31 to Mobile Unit 28 which can in turn provide Information 37 to User 29 through a visual or audible display. In one exemplary embodiment, Information 37 may show the categories and sub-categories currently available in the selecting process defined by Dialogue 31 (e.g. "Movie Theater--San Francisco--Movies Today"). Alternatively, Information 37 may show a variable bar display indicating an estimated percentage of Dialogue 31 completed until Result 32 is expected (i.e. a display showing the rate of progress of Dialogue 31 in narrowing possible matches for Request 30 to a single Result 32). After Dialogue 31 results in a set of data (i.e. name and address of selected movie theater) represented by Result 32, Voice Portal 27 finishes Dialogue 31 and sends Result 32 over Data Channel 34 to Mobile Unit 28. Since the address includes also an electronically readable position of the movie theater, the onboard navigation system included in Mobile Unit 28 can calculate a route and start route guidance.

Detail Description Paragraph (18):
[0033] Another exemplary embodiment for the combined voice and data dialogue of FIG. 4 is illustrated by the following scenario. Request 30 from User 29 corresponds to a request for a vehicle status check from Mobile Unit 28 (e.g "Does the car need a check-up?", "I'm not getting enough power", "What's that noise under the hood?", etc.). The number of variations in the phrasing of Request 30 may require that Mobile Unit 28 communicate the request to Voice Portal 27 via Voice Channel 33. Voice Portal 27 can ascertain the request using a database and/or the Internet in conjunction with voice recognition software. Upon clarifying the request for a vehicle system check, Voice Portal 27 might communicate an electronic vehicle status inquiry in the form of Data Request 35 to Mobile Unit 28 over Data Channel 34. Data Request 35 may be a specific vehicle sensor inquiry or may be a command to send all current and/or all saved or time-averaged vehicle sensor data. Mobile Unit 28 may then respond over Data Channel 34 to Voice Portal 27 with Data 36 corresponding to the vehicle sensor data requested. Voice Portal 27 may then proceed with an analysis of Data 36, or may communicate the data over the Internet (not shown), or another network (not shown), to any of the manufacturer's computer, the dealer's computer, the vehicle owner's chosen service station's computer, a specialized subscription service, or any other computer-networked analytical system (not shown).

Detail Description Paragraph (19):
[0034] Whatever system analyzes Data 36 may respond via Voice Portal 27 to Mobile Unit 28 by Information 37 which may be an instruction to adjust any number of electronically adjustable engine settings (e.g. fuel/air mixture, etc.). Alternatively, another Data Request 35 may be sent to Mobile Unit 28 to obtain more information. Result 32 sent from the analytical system may indicate that a professional service is necessary. Result 32 may also indicate a priority consisting

of either immediate service required, service this week, or service this month. Additionally, Voice Portal 27 may choose a service center based on the priority of the service and a proximity to the current location if the service is immediately necessary, or may start an inquiry with User 29 concerning scheduling a service later in the week. After Dialogue 31 obtains a target service time, Voice Portal 27 may again access the Internet or other network to schedule the service. After scheduling the service, Voice Portal 27 may communicate the scheduled time to Mobile Unit 28 in the form of Result 32 over Data Channel 34, which may in turn inform User 27 as well as set a reminder to remind User 27 on the day of the schedule service and/or within a prescribed time before the service.

Detail Description Paragraph (21):
[0036] Referring to FIG. 5, Voice Portal 27 is accessible from Mobile Unit (not shown) in Vehicle 38 via Voice Channel 33 and Data Channel 34 and via Base Station 39. Voice Portal 27 is able to access Internet 42 to obtain additional information. The system may allow the occupant (not shown) to request over Voice Channel 33 to Base Station 39, and from there to Voice Portal 27, a destination location, for instance. The system may provide for Voice Portal 27 to implement a voice recognition algorithm to produce a set of possible matches for the requested destination location. Voice Portal 27 may connect to Internet 42 to access information from both public and private databases concerning requested locations, traffic, weather, or any other useful information. By outsourcing the voice recognition software and hardware to Voice Portal 27 external to Vehicle 38, the cost of implementing the voice input system is reduced and improved voice recognition systems can be implemented with greater ease. Additionally, the most up-to-date information regarding traffic, construction, and weather conditions, as well as restaurant openings and closings, and other dynamic information (e.g. movies playing and times) are available through the system to a user in Vehicle 38.

Detail Description Paragraph (22):
[0037] The system may additionally provide for Voice Portal 27 to reduce the number of requested destinations to one address through any of several possible methods. One method for reducing the number of matches may be to audibly prompt the occupant with each possible match until an affirmative response is registered. Alternatively, the system may prompt the occupant with questions that distinguish between sub-categories of the set of possible matches. These questions may be designed by Voice Portal 27 to reduce the number of possible matches as efficiently as possible to a smaller set of possible matches, or potentially to one possible match. A third alternative may be for the Voice Portal 27 to prompt the Mobile Unit 28 to provide a current location for Vehicle 38 over Data Channel 34, and then for Voice Portal 27 to limit the possible matches to those destination locations within a predetermined maximum distance from the current location. There might also be an override of this function to allow navigation assistance for longer drives. Some combination of these three possible methods for reducing the possible destination location matches might also be possible. After determining the destination location, Voice Portal 27 might communicate this information directly to Vehicle 38 over Data Channel 34.

Detail Description Paragraph (23):
[0038] Referring to FIG. 6, the system according to the present invention includes a Voice Communicator 40 (for instance a mobile phone) and Data Communicator 41 connected to Mobile Unit 28. Mobile Unit 28 may include Device 25 which may be a navigation device (for instance a GPS receiver) and Device 26 which may be a music system. Using the destination address transmitted by the voice portal (not shown) via Data Communicator 41, Mobile Unit 28 might calculate a route from the current position to the destination based on an algorithm that might include factors including a set of roads in a database, road construction, traffic conditions, weather conditions, and driver preferences. Current construction, traffic, and weather conditions may also be transmitted by the voice portal to Mobile Unit 28 via Data Communicator 41.

Detail Description Paragraph (24):
[0039] Alternatively, the voice portal may calculate a route based on current position information received from Mobile Unit 28, from the destination location determined, from construction and traffic information received from the internet (not show), and any other appropriate information. The voice portal might then transmit the entire calculated route to Mobile Unit 28, which would then guide the user to the destination

along that route, unless deviating requires modifications of the route.

Detail Description Paragraph (28):
[0043] The system of identifying requested locations by Voice Portal 27 and communicating the corresponding destination location from Voice Portal 27 to Device 25 via Data Communicator 41 allows the occupant to input a destination location to Device 25 using voice input only. Voice inputs have the advantages noted above that they do not distract the driver from the driving task, and thereby increase road safety. Device 25 can use any of, or all of, the destination location, a current position, a road/street database, and a route selection algorithm to determine a selected route. Device 25 may use any number of positioning methods to determine the current position and to monitor progress along the selected route. These positioning systems may include GPS, DGPS, AGPS, triangulation, hyperbolic intersection of time-delay solutions, and cell identification.

Detail Description Paragraph (30):
[0045] Referring to FIG. 7, the method according to the present invention is illustrated with a flowchart. Following Start 43, Request 30 originates with an occupant of the vehicle. Request 30 is analyzed in Diamond 44 to determine if the request is for a command and control function of the mobile unit. If Request 30 is identified as a command and control request, then in Box 45 a voice recognition application is applied onboard to Request 30 to identify the request. After Request 30 for a command and control function is identified onboard, the mobile unit then activates that command and control function in accordance with the user's desire in Box 46. If Request 30 is not for a command and control function, the mobile unit opens a voice channel and a data channel with the off-board voice portal in Box 48. After the voice and data channels are opened, Request 30 is communicated to the voice portal for voice recognition in Box 49. Diamond 50 asks whether the voice portal is able to identify the request (either for information, a destination location, or another service) without further inquiry. If further inquiry is required, a dialogue is conducted with the occupant in Box 51.

CLAIMS:

13. The system of claim 7, wherein the onboard device communicates the vehicle position to the voice portal server and the voice portal server uses the vehicle position to ~~reduce a number of possible~~ information matches corresponding to the request.

16. The system of claim 1, wherein the onboard device includes at least one of a navigation system, an information system, and a music system.

26. A method of providing information to an occupant of a vehicle, the method comprising: providing a voice communicator; providing a data communicator; providing an onboard device, the onboard device communicating electronically with at least one of the voice communicator and the data communicator; providing a base station, the base station communicating wirelessly with at least one of the voice communicator and the data communicator; providing a voice portal server, the voice portal server communicating electronically with the base station; and communicating verbally by the occupant at least one of (a) a request for information via the voice communicator and via the base station to the voice portal server and (b) a function command to the onboard device.

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TITLE: Method and system for wireless voice channel/data channel integration

Summary of Invention Paragraph (4):
[0003] Access to data and services through electronic networks has become a necessary part of everyday personal and business life. Especially since the Internet became widely accessible, many people increasingly rely on accessing Internet data and services through a variety of devices. Businesses, or enterprises, also use networks to make specific data and services available to employees, partners, and customers. Traditionally, the devices used to access networks were wired to the network. Examples include wired computers and wired telephones. Increasingly, however, people want to be able to access network data and services anywhere using portable, wireless devices such as wireless telephones and hand-held personal data assistants (PDAs). Enterprises now seek the ability to provide wireless access to data and services that is just as complete and easy as wired access. The arrival of wireless Internet telephone devices makes it possible to integrate voice and data services that combine the advantages of either access method. Integration of multiple communication channels such as voice and wireless data has, however, proven challenging.

Summary of Invention Paragraph (5):
[0004] Traditional multi-channel integration approaches to, for example, customer relations management (CRM), only involve computer telephone integration/interactive voice response (CTI/IVR), web, email, chat, and voice over Internet protocol (IP). Existing integration approaches have the disadvantage of sharing multiple data sources that at best facilitate one channel process (e.g., voice channel with screen pops for a call agent). The lack of channel integration in traditional approaches hinders a satisfactory solution to wireless access to enterprise data and applications, or services.

Summary of Invention Paragraph (8):
[0007] Another disadvantage of traditional techniques for accessing WAP sites is inferior device location technology. For many applications, the current location of the wireless device is important. For example, map services or yellow page services may be keyed to the location of the wireless user in order to provide only pertinent information. While multiple location technologies exist, not all are expected to be available and operational in every network, for every device, and at each location within the network. Furthermore, the position measurements retrieved from the location networks may require further processing to obtain the desired data format or related information (e.g., directions to a site). Besides location processing, there is also a need to obtain proper authorization for locating a mobile device. Current approaches lack the ability to mediate among network entities, preferences, authorizations, and related functions.

Brief Description of Drawings Paragraph (6):
[0017] FIG. 5 is a block diagram of an embodiment of a computer telephony integration/interactive voice response (CTI/IVR) service.

Brief Description of Drawings Paragraph (36):
[0047] FIG. 21 is a block diagram of an embodiment of navigation and presentation services.

Detail Description Paragraph (3):

[0066] A system and method for integrating wireless data and voice calls that explores the advantages of both access methods are described. Embodiments include computer telephony integration/interactive voice response (CTI/IVR) integration including a wireless data and wireless voice channel that is wireless protocol independent. The CTI/IVR integration includes protocols with which voice calls can be triggered in a wireless data session and with which data sessions can be triggered by a voice call or by an actionable alert. Actionable data from the actionable alert allows the control of navigation from a wireless channel to a voice channel and vice versa during a communication session. Significantly, session data is shared between the voice channel and the data channel during a communication session. Voice data can trigger a data session in a push action or a pull action. Similarly, data can trigger a voice session in a push action or a pull action. One embodiment includes initiating a wireless applications protocol (WAP) session from a voice call, thus removing the problems that a traditional wireless user would have in navigating to a WAP site. A WAP session is presented to the user as a result of placing a normal telephone call. In one embodiment, initiating the wireless data WAP session comprises sending a message to a device, and receiving from the device a selection of a uniform resource locator (URL) within the message. In response to receiving the selection of the URL, a data session is initiated to a web server. In one embodiment, the message is a short message service (SMS) message.

Detail Description Paragraph (4):
[0067] One embodiment includes a central gateway through which wireless device users access multiple applications. These accessible applications could be hosted locally (in the same physical location or the same administration domain as the gateway), in the same Intranet behind the firewall, or anywhere on the Internet. In one embodiment, an apparatus architecture includes a tiered topology that supports large-scale, high performance, mission-critical wireless applications on a variety of devices. The method and system integrate various wireless applications with existing wireless network infrastructure, including wireless Internet infrastructure. The method and system further integrate multiple wired and wireless devices with the network, including providing a consistent user interface across multiple wireless devices. The method and system include numerous wireless applications that facilitate the wireless devices user's access to network services. One embodiment includes computer telephony integration/interactive voice response (CTI/IVR) integration. The CTI/IVR integration adds a wireless protocol independent wireless channel. The CTI/IVR integration presents actionable data that allows the control of navigation from a wireless channel to a voice channel and vice versa.

Detail Description Paragraph (6):
[0069] FIG. 2 is a block diagram showing more detail of the architecture 104. A network integration layer 202 components includes a wireless application protocol (WAP) gateway, homepage provisioning, a CTI/IVR service, a wireless telephony applications service, a WAP push gateway, a voice extensible markup language (voice XML) gateway, a location gateway, and a short message service (SMS)/email gateway. Various components of the network integration layer will be described in more detail herein. An enhanced services layer 204 includes a messaging service, a navigation service, a cookie management service, a two-way wallet service, a device management service, a session management service, a single sign-on service, a voice portal, a presentation service, and a personalization service, some of which are described in more detail below. A wireless application layer 206 includes enterprise applications, portals, exchanges, existing wireless applications, etc., as shown. The integration layer 208 includes an XML engine and an infrastructure engine interface.

Detail Description Paragraph (8):
[0071] FIG. 4 is another view of the interaction between the wireless devices and the customer systems. The dotted line indicates that the items excluding the wireless devices 406 and the customer applications 420 are included in the architecture. The wireless devices 406 communicate with a navigation service 408, which routes data in two directions. The navigation service 408 communicates with a device management service 410 and a session management service 412, which are each enhanced services of one embodiment. The device management service 410 verifies the identity of the wireless device and its type. The session management service 412, which will described in more detail below, returns a menu to the wireless device 406. The menu is part of a configurable, consistent user interface that facilitates the wireless device user's

network access. A single sign-on service 416 and the cookie management service 418 are further enhanced services that will each be described in more detail. In general, however, the single sign-on service 416 allows the wireless device user to sign on once, with minimum actions on the user's part, to access a wireless network session that may include communication with many sites and applications. The cookie management system facilitates the maintenance, storage, and control of consistent user information, which normally cannot be stored on the wireless device 406. The navigation service 408 transmits a device type to the extensible style-sheet language template (XSLT) repository 414, and a specially formatted presentation appropriate for the particular wireless device 406 is returned. XSL templates will be discussed in more detail below. The menu and the specially formatted presentation facilitate the user's data request to the customer application 420.

Detail Description Paragraph (11):
[0074] The CTI/IVR service 500 controls navigation from a wireless data channel to a voice channel and vice versa. In one embodiment, the CTI/IVR service 500 operates where telephone calls can be triggered in a wireless data session. Automatic number identification (ANI) data, dialed number identification service (DNIS) data, and unique identifier (UID) data is sent to a workflow-based decision system 522 and a work agent 524, and is processed by a history and action aggregator 514. A session management service 510 publishes data to an XML-based messaging bus 512, which subscribes to the history and action aggregator 514. The history and action aggregator uses the subscription information to access a customer layer 536. The customer layer 536 includes ecommerce transactions 526, chat history/data 528, email history/data 530, voice over Internet protocol (IP) history/data 532, and legacy and other data 534.

Detail Description Paragraph (21):
[0084] A VoiceXML gateway 608 receives calls from wireless devices 606 or from wired device 607. VoiceXML gateways are Internet based telephony platforms over which a user can submit a VoiceXML document and initiate an audio dialog with the document over standard telephony channels. VoiceXML is a standard designed by the World Wide Web Consortium (W3C) to create audio dialogs that feature synthesized speech, digitized audio, recognition of spoken and DTMF key input, recording of spoken input, telephony, and mixed-initiative conversations.

Detail Description Paragraph (22):
[0085] Internet protocol (IP) data is sent to software 610. In one embodiment, the software 610 is a data voice telephony (DVT)-VoiceXML application engine, which includes automatic speech recognition and a text-to-speech (TTS) interface. For example, Nuance.TM., Speechworks.TM., and Fonix.TM. can be used. The software 610 also includes a hypertext transfer protocol (HTTP) directory client, dynamic grammar generation, a domain/personalization manager, an audio content manager, and an instant messaging and notification hierarchy. The software 610 is in communication with a web server 612. Referring to FIG. 2, the location gateway 616 is part of the network integration layer between the enhanced service layer and the devices 606 and 607. The session management service 614 and the mail or messaging service 618 are enhanced services between the network integration layer and the wireless application layer. An integration interface 620 is part of the integration layer between the wireless application layer and the customer system layer. Referring again to FIG. 6, the customer applications 602 include customer relations management software, enterprise relationship software, ecommerce software, etc.

Detail Description Paragraph (26):
[0089] In both of the examples a significant benefit is the ability of an end user to easily gain access to the relevant wireless data site without having to navigate multiple menus or enter a string of characters on the wireless device. This is a benefit to both the user and the company that wishes to have customers access company information over a wireless channel. Many applications benefit from initiation of a wireless data session by a voice call. They include customer service, direction finding, package tracking, movies, banking, gambling, and virtually any other interactive voice response (IVR) application.

Detail Description Paragraph (84):
[0145] In one embodiment, the incall agent 801 is a Java class. The content manager

842 is an XML parser that is a Java class module that supports VoiceXML configuration. Configuration 846 is part of an administrative web site, and defines installation and configuration parameters, such as prompt language and file directories. The IVR/DTNF dialog manager 840 is a VoiceXML document that defines the DTMF-based IVR dialog (without voice recognition). This document is managed by the web server of the architecture platform 804 with a pre-defined URL for the VoiceXML gateway 832 to fetch.

Detail Description Paragraph (109):
[0169] In one embodiment, the incall agent is a Java servlet based software module that acts as a link between the customer application and the IVR component. The incall agent uses the standard Internet HTTP protocol to communicate with the IVR, as well as to return status codes to the customer application. The incall agent also verifies that incall requests emanate from known authorized hosts, and manages assignment of requests to available hosts.

Detail Description Paragraph (113):
[0173] The incall agent uses the standard Internet HTTP protocol to communicate with either the incall service IVR running on a Dialogic.TM. D41/ESC based telephony platform or the incall service IVR/DTMF dialog manager implemented as a set of VoiceXML documents which reside on the web server of the architecture platform. In addition, the incall agent sends the appropriate response messages to the response URL (if specified) that may or may not be a part of the customer application requesting the incall service. Specifically, the incall agent performs the following tasks:

Detail Description Paragraph (114):
[0174] for each HTTP request from the customer application, normal Internet status codes are returned, i.e., 200 for valid request and 400 for failing to parse the arguments to the HTTP request;

Detail Description Paragraph (153):
[0204] Every XML file requires a service name element, such as <Service name="some text">. Because the name attribute does not have any limit on text strings, the content manager maps each name string into a unique service ID using some algorithm. For example, a name string "movie sales online store" may be mapped into "moviesale1404", which is the first two words plus a 4-digit sequence number.

Detail Description Paragraph (223):
[0265] The "cache" is a module used by the outcall IVR. Cache is a class that maintains a map of audio data specifiers, such as a URL, a disk file name, or literal text, and the corresponding path to a local disk file. It provides methods to add entries or arrays of entries, transparently invoking TTS code or web client code to process literal text or URLs. Audio content should be added to the cache before a call is placed or received, to avoid delays associated with TTS or downloading.

Detail Description Paragraph (231):
[0273] The following use cases illustrate the outcall service. The outcall service initiates a call to an end user when instructed to do so by a customer application. The customer application, at a scheduled interval, requests the outcall service to make an outbound call to the end user and play a specified message. For instance, this message may be a daily analyst report or the traffic and weather report. The outcall service can be used to escalate message service. Because browser alerts, email alerts, and SMS alerts may not reach a roaming user, a customer may wish to contact an end user with the outcall service if attempts at sending other types of alerts have failed.

Detail Description Paragraph (236):
[0278] FIG. 14 is a block diagram of a homepage provisioning method as performed by an embodiment of a voice channel homepage provisioning service. Voice channel-based homepage provisioning is another example of initiation of a wireless data session by a voice call. Traditionally, for example in the WAP/HDTP world, the "homepage" is controlled by the carrier or has to be manually entered by the user on the wireless device. In order to go to a URL for an enterprise site that is not on the carrier's homepage, the user must know the "goto" URL and enter it manually. To avoid this, a large enterprise, such as a major Internet service provider, might have to pay a fee

to be on the carrier's homepage. In this case, the user must still enter the URL on the wireless device configuration. In either case, a new URL change results in another manual URL entry process.

Detail Description Paragraph (239):
[0281] The voice channel homepage provisioning service, in one embodiment, is voice-activated using speech recognition and voice short cuts, such as, "send homepage to my WAP wireless device", or "send 800-flower homepage to my WAP wireless device", etc. The homepage provisioning service can also be an 800 number based service. In this case, the service immediately terminates the call upon receiving the caller ID in order to avoid incurring the call cost. Once the caller ID is received, the service can immediately register a push actionable alert embedded with the URL to, for example, the CTI/IVR service 500 of FIG. 5 to be delivered by the messaging service 1404 via an alert. For efficiency, the actionable alert can talk directly to the messaging service for delivery.

Detail Description Paragraph (244):
[0286] FIG. 15 is a block diagram of an embodiment of the location service 1502 showing its interaction with other services/entities. The location service 1502 includes various services, such as location session management, query and attachment services, location capability management, pre-fetching, access control, location calculator management, format conversion, geographic information system (GIS) services, tracking, auditing, and user privacy. The location service is in communication with auxiliary servers 1504, positioning networks 1506, and application servers 1510. The location service also communicates with a proxy server and services 1508 that are part of the wireless network communication architecture. Communication between the location service 1502 and other services/entities provides data to the services/entities so that enhanced functionality results. For example, the location service 1502 supports roaming, handoff, and the application of multiple position techniques for a user in a given location (e.g., GPS, TDOA/NAOA). Additional functions of the location service include: managing positioning for tracking and delayed location requests; forwarding a request to positioning equipment in response to a request from an application; storing internal records with user permissions and passwords, and prompting the user for permission if no record exists; and improving position measurement acquisition time by giving location equipment a head start for a given user (prior to receipt of a location request). The GIS services provide application format conversion, proximity and routing services.

Detail Description Paragraph (246):
[0288] The interaction of location services 1612 with the services and entities shown allows various functions to be provided transparently. For example, the following functions are performed: auditing, including measuring use (in peg counts) in categories based upon subscriber, application, network, etc., for purposes such as billing, feature customization, usage tracking, etc; managing position data formats; and storing the last known location (for example, for retrieval after temporary loss of GPS coverage, which avoids GPS warm-up delay).

Detail Description Paragraph (247):
[0289] The architecture (as shown, for example, in FIG. 2) includes a central gateway through which wireless device users access multiple applications. These accessible applications could be hosted locally (in the same physical location or same administration domain as the architecture), in the same intranet behind the firewall, or anywhere on the Internet. Each of these accessible applications may have very different authentication and authorization requirements. In prior system, users are required to sign on to each of these applications whenever they access them. The single sign-on service, which is part of the enhanced services layer 204 (FIG. 2), reduces the user inconvenience associated with signing on to various applications. Various embodiments of the single sign-on service are shown in FIGS. 17, 18 and 19. One embodiment, shown in the block diagram of FIG. 17, is a single sign-on service with low-level security. Each user of a wireless device 1706 initiates a wireless session by signing on using a previously assigned single sign-on (SSO) identification (ID). This session is valid and effective until a predefined expiration time is reached, or the user explicitly signs off. While the SSO session remains effective, all application sign-on requests by the user are intercepted and handled by the single sign-on service on the user's behalf. If a SSO session has never been established or

has expired, the user is prompted for a SSO sign-on ID. Signing on establishes a wireless SSO session with the gateway through the device management service 1708. The single sign-on service 1710 performs an appropriate sign-on process to each application of customer applications 1711-1713 on behalf of the user. The customer application refers to a previously compiled authorization table 1714. The single sign-on service will perform the sign-on process whenever the user accesses a customer application, until the SSO session is no longer valid. The SSO session is applicable to application sign-on requests only. It is independent of the sessions between the user and the applications themselves after a successful sign-on to those applications. If an SSO session expires before an application session expires, the user can continue interacting with that application. On the other hand, if the application session expires before the SSO session does, then the user must sign on to the application again, and the single sign-on service will intercept that request and handle it as usual.

Detail Description Paragraph (257):
[0299] As shown in FIG. 20, a user of a wireless device 2006 accesses an Internet site via navigation service 2008. The history database captures recent URLs, form data, and user session data from the user's ID. The history database information can come from various sources, including the cookie management service 2018, and the personal computer (PC) 2012. An enterprise (for example, "company A") using the architecture of FIG. 2 can configure its session management service preferences using the "Configure Session Management" menu 2014. The user uses the menu 2010 to resume a session, start a new session, or choose a starting point from the user's own history list. The session management is maintained in a hierarchical tree manner. The user can move from one site, for example a portal site, to a second site. When a connection is dropped, the session can be resumed at the second site when the user visits the portal site again. This also allows a user to maintain sessions at different sites. For example, after visiting the second site from the portal domain, the user can go back to the portal, and then to a third domain domain. The user can later go back to the previous location at the second site, back to the previous location in the third domain.

Detail Description Paragraph (261):
[0303] FIG. 21 is a block diagram showing navigation and presentation services of the architecture of FIG. 2. The navigation and presentation services 2108 and 2110 provide a user-friendly, device-independent wirelessly-enabled front-end to customer legacy systems. Through the device management service 2112, users are presented with wireless markup language (WML) specific to the wireless device 2106 they are using. In one embodiment, the navigation and presentation services 2108 and 2110 are used to integrate the entire suite of services in the architecture of FIG. 2 (e.g. session management, cookie management, etc.). The navigation service 2108 communicates with the device management service 2112 to verify device type. The navigation service 2108 requests data from the appropriate customer application 2114 dependent upon the user's inputs to the wireless device. The customer application 2114 returns data in extensible markup language (XML) to the navigation service 2108. Dependent upon the device type, the presentation service 2110 applies the correct device-specific extensible style-sheet language template (XSLT) to the XML document. Presentation formatted for the specific wireless device 2106 is sent to the device 2106 via the navigation service 2108. The navigation and presentation services provide a personalized, device-independent, wireless front-end that can be easily customized to integrate with legacy systems. Through the integration of the navigation and presentation services with the suite of enhanced services, a flexible and powerful mechanism to design and maintain application functionality is provided. The requirement for hand coding data is greatly reduced. For example hand coding is reduced for presentation, for directing how data will be used, and for navigating through options.

Detail Description Paragraph (262):
[0304] The navigation and presentation services provide platform-independence, data-source-independence, a high degree of personalization, and a distributed implementation that can be hosted anywhere. In one embodiment, the navigation and presentation services act as a WAP front-end to customer legacy systems. They can also be used as a stand-alone application, as well as integrated with the entire suite of enhanced services (as shown in FIG. 2).

Detail Description Paragraph (263):
[0305] FIG. 22 is a block diagram showing one embodiment of the cookie management service 2202. Cookies are useful to save logon information, session information, personal information, etc. These types of information are essential for wireless devices. The cookie management service 2202 is a network-based cookie management system, unlike typical desktop-based or client-based cookie management systems. The cookie management service 2202 allows cookies to be accessible and managed (e.g., cookies can be locked) anywhere on the Internet, and supports multiple users. The cookie management service includes web interface 2210 for personalization and management. The user communicates with the device management service 2208, which in turn communicates with the session management service 2216 and the cookie management service 2202. The session management service 2216 sends "getcookie" and "setcookie" commands and data to the cookie management service 2202. The cookie management service 2202 includes a user preference database that stores preferences modified using the desktop interface 2210. The cookie management service further includes filter functions and a cookie management database. The customer applications 2212 receive information from the cookie management service 2202.

Detail Description Paragraph (265):
[0307] In one embodiment, the cookie management service is deployed as a proxy-based value added service with features such as cookie session management, navigation, profiling, preferences etc. The cookie management service is positioned on the back-end of the WAP gateway in carrier, or alternatively on the back-end of the enterprise, or customer system. Alternatively, the cookie management service is positioned on the front-end of the enterprise applications. In either case, the cookie management service can be a plug and play "middleware" hardware and software application.

Detail Description Paragraph (273):
[0315] The user communicates with the navigation service 2408, which communicates with the device management service 2402. The device management service 2402 includes a device entry database, and a user entry database. An entry in the device entry database is accessed for the calling device 2406, or if there is no entry one is created using a login and password. The device management service 2402 communicates with other services, such as the session management service 2410, the cookie management service 2412, and the single sign-on service 2414.

Detail Description Paragraph (282):
[0324] The telephony platform may be implemented, for example, as a VoiceXML script. As the traffic for this management application is negligible, the cost for providing this service is significantly reduced in a hosted environment.

Detail Description Paragraph (289):
[0331] As part of the wireless network communication architecture 104, The XSL style-sheet template generator is part of an application development platform (e.g. presentation services, application editor/navigation-model- er, transcoder etc). It can be used with the transcoder to produce design-time style-sheets for the transcoded XML data source from hypertext markup language (HTML). These style-sheets can then be used by the presentation service for run-time transformation based upon device characteristics.

Detail Description Paragraph (291):
[0333] A more usable approach is to allow end users to select from their own previous inputs. The additional use of earlier web-based inputs extends this approach to encompass more of the user's previous inputs and allows WAP/HDTP sites to effectively support additional functionality in a usable manner. As shown in FIG. 27, a web site is tied with a companion WAP site to provide value to the end user and for the business providing the service. The inclusion of this function does not negatively affect the design of an already existing web site or WAP site. The user of wireless device 2706 contacts the prefill service 2710 through the navigation service 2708. The prefill service 2710 communicates with the web site user input database 2718 and the WAP site user input database 2712 to send user input updates and receive previous user inputs. User input updates are passed to the corporate web site 2714. History data and form data are exchanged with the corporate WAP/HDTP site 2712 via the XML messaging bus 2720.

Detail Description Paragraph (295):
[0337] Many WAP/HDTP based applications act as an additional channel for existing web sites. In one embodiment, inputs are mapped from a web site into a companion WAP/HDTP application. This requires a web site to which the user must log on. Examples include portals, stock brokers, travel sites, and banks. Preferably, an input field in the web site is associated with an input field in the WAP/HDTP site. When the user is identified, their previous inputs to the web site are displayed in the prefill select card of the WAP/HDTP site. Depending upon deck size, the prefill select cards can be separated from a long input deck and prefetched as a separate deck. In one embodiment, prefetching is done using either HDML or WML 1.1 with UP.Browser 4.x or later, using known extensions, such as OpenWave.TM. extensions. This allows navigation between the input deck and the prefill select cards without significant degradation in response times.

Detail Description Paragraph (296):
[0338] Another application that enhances the experience of the wireless device user is the password management service 2802 illustrated in FIG. 28. The password management service 2802 reduces the complexity of corporate passwords. This is especially useful when only a telephone keypad is available as an input device. The wireless device 2806 user accesses the password management service 2802 through the navigation service 2808. The password management service 2802 communicates with the navigation service 2808 to send and receive history, form data, and actions via the XML messaging bus 2814. The password management service 2802 sends lightweight directory access protocol (LDAP) queries to the corporate LDAP database 2812. The corporate LDAP database 2812 contains passwords, identification numbers, etc. Various corporate databases 2810 transmit standard password queries to the corporate LDAP database 2812 and receive "real" passwords from the password management service 2802.

Detail Description Paragraph (321):
[0363] A customer (e.g., a large corporation or a provider of a specific Internet service) provides a customer application that sends the fax agent the required parameters via an HTTP request. For instance, this application could be WML software for the callers who use their services. The software can allow the callers to traverse menus on their handset, and select a document to send to a specified fax number. When the caller presses a fax softkey, the HTTP request is sent to the fax agent.

Detail Description Paragraph (322):
[0364] In one embodiment, a WebFax.TM. component of the fax service uses Microsoft Internet Explorer Automation.TM. to navigate to the requested URL and prints the page through the Peernet.TM. Doc-to-Fax printer driver, which creates a TIFF file suitable for faxing through GammaLink.TM. API calls.

Detail Description Paragraph (323):
[0365] The fax agent acts as a link between the customer application and the WebFax.TM. component. The fax agent uses the standard Internet HTTP protocol to communicate with WebFax.TM., as well as to return status codes to the customer application. WebFax.TM. is the component responsible for sending the fax itself. It acts as an HTTP server and is activated when it receives a request that a document be faxed to a given number. Legal documents are documents that can be displayed with a web browser not using any special plug-in (such as Acrobat.TM. reader).

Detail Description Paragraph (348):
[0384] The fax agent acts as a link between the customer application and the WebFax.TM. component. It uses the standard internet HTTP protocol to communicate with WebFax, as well as to return status codes to the customer application.

Detail Description Paragraph (371):
[0404] The transmitted fax consists of the contents of the Internet Explorer.TM. windows in which the web documents were rendered. If any document is longer than the window, the entire document will nonetheless be converted to a TIFF file and faxed. If a web document contains frames, each frame will be appended sequentially to the TIFF file as if it were a separate document; the original layout of the web page is not preserved. All such TIFF files will be sent within one fax session.

CLAIMS:

2. The method of claim 1, further comprising a call service that facilitates the communication session, including: communicating with a customer application to receive a specification of data to be pushed or pulled during the communication session; performing data formatting as required on data to be pushed or pulled during the communication session; and communicating with an interactive voice response (IVR) application, including transferring formatted data to the IVR application for delivery to a wireless device and receiving data from the wireless device via the IVR application.

17. The wireless communication method of claim 12, further comprising navigating data that was pushed or pulled from the voice channel or the data channel, wherein navigation functions include fast forward, rewind, pause, and delete.

19. A system for wireless network communication, comprising: at least one network coupled among two or more wireless communication devices and at least one customer application; two or more components coupled to the at least one network, including, a computer telephony integration/interactive voice response (CTI/IVR) service, a fax service, a call service, a fax service, and a directory service, wherein the wireless communication devices access the components during a communication session, and wherein the communication session includes, triggering a wireless data session with a wireless data channel from a voice session, including pushing data to the wireless data channel and pulling data from the wireless data channel; and triggering a voice session with a voice channel from a wireless data session, including pushing data to the voice channel and pulling data from the voice channel, wherein during the communication session, data is shared between the wireless data channel and the voice channel.

22. The system of claim 19, wherein the call service component includes: an incall service, wherein the incall service, an outcall service; and a call service interactive voice response (IVR) application, wherein the incall service, receives content from the at least one customer application, wherein the content is selected using a wireless communication device; transfers the content to the IVR application; notifies the customer application that the IVR application is ready to communicate with the wireless communication device; and sends an identifier of the wireless communication device and a status message to the customer application, wherein the status message indicates a status of communication between the wireless communication device and the IVR application.

32. The electromagnetic medium of claim 27, further comprising navigating data that was pushed or pulled from the voice channel or the data channel, wherein navigation functions include fast forward, rewind, pause, and delete.

34. A wireless communication apparatus, comprising: means for triggering a wireless data session with a wireless data channel from a voice session, and for triggering a voice session with a voice channel from a wireless data session, wherein during the communication session, data is shared between the wireless data channel and the voice channel; and call service means for facilitating the communication session, including, means for communicating with a customer application to receive a specification of data to be pushed or pulled during the communication session; means for performing data formatting as required on data to be pushed or pulled during the communication session; and means for communicating with an interactive voice response (IVR) application, including transferring formatted data to the IVR application for delivery to a wireless device and receiving data from the wireless device via the IVR application.

35. The apparatus of claim 34, further wherein the call service means further comprises an incall service means that that handles voice channel content to be sent to a wireless device in response to a request from the wireless device, the incall service including; means for receiving content from the customer application, wherein the content is selected using a wireless device; means for transferring the content to an interactive voice response (IVR) application; means for notifying the customer application that the IVR application is ready to communicate with the wireless device; and means for sending an identifier of the wireless device and a status message to the

customer application, wherein the status message indicates a status of communication between the wireless device and the IVR application.

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DOCUMENT-IDENTIFIER: US 20010029425 A1
TITLE: Real time vehicle guidance and traffic forecasting system

Abstract Paragraph (1):
Real time vehicle guidance by central traffic unit is provided by a system which includes a central traffic unit, a plurality of vehicles equipped with mobile guidance units, and communication system based on GSM/GPS technology. The central traffic unit maintains the perpetually updated database of travel times for all sections of roads, while mobile guidance units include mobile cell phone handset units located in mounting receptacles (and used for determining their present position) and communicatively linked to the central traffic unit computer server. Mobile guidance units also comprise smart card capable to detect when a mobile cell phone unit is located in the mounting receptacle. All vehicles in which mobile cell phone units are so located can be used as probe vehicles. The central traffic unit uses those probe vehicles as antennas by tracking their positions for creating and maintaining a network of real time traffic load disposition in various geographical areas. To be able to detect a bottleneck situation when it arises and to estimate a current travel time for a corresponding section of road, the central traffic unit maintains a list of probe vehicles that have recently exited that section. If the times those vehicles have spent on the section differ considerably from a regular travel time stored in the database, the central traffic unit uses statistical tools for forecasting the future travel time along this section. In response to a request from a driver for a route update from his present position to a desired destination communicated via mobile phone to the central traffic unit, the central traffic unit calculates the desired fastest route by utilizing both the regular travel times along segments of roads and predicted current travel times calculated by using information collected from probe vehicles. By appropriately combining those travel times, the central traffic unit calculates the fastest route based on the most updated information on traffic load disposition. Thereafter the route is communicated to the corresponding mobile guidance unit for displaying it on the computer screen and/or communicating it to the driver by voice. Moreover, the guidance system allows the driver to enter alternative time schedules for the same destination and receive alternative travel time estimates reflecting different estimated travel times along the roads at different times. Additionally, the central traffic unit can relate to the driver new and updated information on current traffic jams, slow-down bottleneck situations, etc. in a

Summary of Invention Paragraph (3):
[0003] This invention relates to communications and statistical analysis of vehicle movement. More particularly, the invention relates to communication with vehicles for the purpose of supplying traffic condition information and analyzing data relating to traffic conditions.

Summary of Invention Paragraph (5):
[0005] Conventional on-vehicle guidance systems are usually stand-alone applications wherein the traffic data are static and cannot be easily dynamically updated. Consequently, the proposed routes are accurate only under ideal traffic conditions. The stand-alone versions cannot take into account current traffic jam conditions or real time emergencies. Hence, even when a so-called "optimal route" is found, it may not be usable solution in real time situations and can only be used as a general recommendation. Other systems rely on electronic and optical sensors situated at various key locations to measure and update the current traffic loads. These systems are typically costly to install and to maintain and to be effective they must be

distributed over large sectors of roads. Still other real time traffic control systems utilize real time field information typically gathered from various service vehicles such as traffic police, ambulances, road maintenance teams, etc., which is usually transmitted by radio to the control center and from there broadcasted to the public.

Summary of Invention Paragraph (6):
[0006] Use of a database for determining traffic jams and other bottleneck situations is addressed in U.S. Pat. No. 5,699,056. Data is obtained from traveling vehicles, including their IDs, positions, times, and speeds. A jam is presumed if an average speed of a block of vehicles is less than a predetermined value. This arrangement requires that data concerning relevant conditions of a large number of road sections be provided. The prior art requires evaluation of vehicle speeds and averaging them over a block. This seemingly innocuous operation may highly problematic, however, within a traffic jam as many if not all speed measurements may return zero values. In other words, speed as a function of time may be wildly discontinuous and measuring it on time grid of a minute may prove highly inaccurate. The definition of blocks is not quite clear. No technique is given for partitioning the vehicles into blocks. The number of roads or more precisely, sections of roads may be very large, say, tens of thousands. It may be difficult to cover them all, i.e. store all the relevant data, process and update it on-line. An important point in his solution is evaluating vehicle speeds and averaging them over a block. This seemingly innocuous operation may highly problematic; however, within a traffic jam as many if not all speed measurements may return zero values. In other words, speed as a function of time may be wildly discontinuous and measuring it on time grid of a minute may prove highly inaccurate.

Summary of Invention Paragraph (7):
[0007] Koutsopoulos and Xu's paper is theoretical, and uses mathematical techniques and computer simulations for studying various methods of predicting future travel times under conditions of traffic congestion. Their results are interesting but they cover a tiny simulation model under a number of assumptions which may or may not be valid in large scale systems.

Summary of Invention Paragraph (8):
[0008] A comprehensive and obviously expensive experimental project ADVANCE is described in a series of technical reports obtainable at the Web site http://jungle.dis.anl.gov/advance. Many of their algorithmic decisions appear to be similar though not identical to ours while some of the most significant differences may be summarized as follows. They used "pure" GPS technology coupled with RF transmitters for transmitting location information from the equipped vehicles to the base station. Their fleet of equipped vehicles was extremely small (about 80 cars) and experimental. As opposed to this, we propose to utilize the GSM/GPS technology available from a number of telecommunications operators and quickly becoming an industry standard. As a result, our fleet of vehicles is going to be limitless for all practical purposes. Furthermore, in ADVANCE all route planning was performed in vehicles which necessitated maintenance of updated databases in all vehicles. In our system, all planning is done at the central server which greatly facilitates system's functioning and makes vehicles's equipment simpler and less costly.

Summary of Invention Paragraph (9):
[0009] Other proposed methods and systems for determination of dynamic traffic information and traffic events use wide coverage mobile telephone network such as GSM or CDMA. For example, U.S. Pat. No. 6,012,012 utilizes manual or remote interrogation system for storing location and other traffic related behavior and then transmit it by radio broadcast or mobile telephone system to the terminals of road users. However, this information is presented to the users in audio, visual or graphic means, and no attempt is made to provide alternative routes or navigation instructions based on this information.

Summary of Invention Paragraph (11):
[0010] The present invention contains the vehicle guidance system consisting of a plurality of vehicles equipped with MGUs, the CTU, and a communication system provided by the telecommunication service provider. By utilizing GSM/GPS technology, or GSM technology, or other wireless technology, the CTU tracks the positions of MGUs and updates in real time the database of travel times for all roads. In response to a

request from a driver for a route update from his present position to a desired destination, it calculates the desired fastest route by utilizing both the regular travel times along segments of roads and predicted current travel times found by using information collected from tracking routines. Thereafter, the route is communicated to the driver. In addition to GSM it is contemplated that CDMAu and other mobile telecommunications formats will be used.

Summary of Invention Paragraph (12):
[0011] The present invention, provides a real time vehicle guidance system is capable of providing optimal route from the present position of a vehicle to a desired target destination when traffic jams may be present. This reduces the burden upon the driver when the vehicle is traveling at high speeds on unfamiliar roads. Thereafter the optimal route found is communicated to the driver and displayed on the vehicle's computer screen featuring the digital map of the relevant region and/or via audio instructions.

Summary of Invention Paragraph (13):
[0012] The travel time between two road intersections A and B is the sum of travel times for all sections of roads connecting A and B on the shortest route either by the minimal time criterion, or by some other criterion. Then in order to be able to compute a travel time between two positions on a map, we must be able to determine travel times for all sections of roads connecting those positions, or road intersections close to them. In the standard solution (an autonomous or stand-alone on-vehicle application), a route is computed by a mathematical optimization algorithm while travel times are computed as distances divided by maximal allowed speeds. While being simple, such solutions have an obvious shortcoming in that they do not take into account the real conditions on the roads and therefore can serve only as a guidance suggestion.

Summary of Invention Paragraph (15):
[0014] 1. Temporary changes in road conditions known in advance like closed roads under construction, traffic reroutes, etc.;

Summary of Invention Paragraph (17):
[0016] 3. Sudden unpredictable changes such traffic accidents, traffic congestion due to sudden and drastic changes in traffic arrangements because of visiting dignitaries, etc.

Summary of Invention Paragraph (19):
[0018] The guidance system according to the present invention consists of CTU and a fleet of MGUs, i.e., traveling vehicles with mobile phones connected to the communication system. Each traveling vehicle may function both as a probe vehicle and as a client vehicle. When a phone handset unit is located in the mounting receptacle, the vehicle functions as a probe vehicle for data collection. This data collection is performed by permanent monitoring of vehicle positions by means of GSM/GPS or other wireless technology while vehicles are in motion and by concurrent measuring of their current travel times along a broad range of roads.

Summary of Invention Paragraph (21):
[0020] At any point of the journey the driver can enter a request for alternative route and will receive an updated route reflecting the real time traffic situation directly on his display panel. The information will also be updated by visual and audio instructions, and driver's vehicle position will be displayed on the display unit.

Detail Description Paragraph (2):
[0046] A major goal of the invention is to provide a real time travel Guidance System capable of handling a driver's request for a fastest route to any destination. At any point of the journey the driver can enter a request for alternative route and will receive an updated route reflecting the real time traffic situation directly on his display panel. The information will also be updated by visual and audio instructions, and driver's vehicle position will be displayed on the display unit.

Detail Description Paragraph (17):
[0061] FIG. 1 is a schematic representation of the information exchange between CTU,

MGUs and a GSM network server in a guidance system. In addition to GSM it is contemplated that CDMA and other mobile telecommunications formats will be used. It represents client vehicles equipped with hybrid GSM/GPS positioning devices automatically receiving the satellite (Unit 1) GPS data, communicating it to CTU Server (Unit 5), and using existing GSM Network Service (Unit 4). The vehicle's real time position data containing the present position, the observation time, and vehicle's ID are transmitted via separate mobile phone telematics protocol (MPTP, Unit 3) at preset time intervals. Location data from all signal vehicles are temporarily stored on The GSM network server (Unit 4) in a multiple-GPS locator packet (MGLP, Unit 6). The CTU Server accesses the MGLP on the network server via automatic packet interrogation (API, Unit 7) process. After processing the information, CTU updates its database. At any given moment, the CTU also maintains the database containing travel times for all sections of roads at a particular time of the day, for a particular of day of the week, etc. Initially, those travel times are theoretical travel times but as the time goes by and observational data are being collected and processed, they are replaced by regular (empirical) travel times reflecting realistic travel conditions, and on particular occasions by current travel times, which reflect sudden and unpredictable changes in traffic conditions.

Detail Description Paragraph (18):
[0062] On receiving a navigation query (Unit 11) from a GSM Network driver/subscriber for a shortest route to a particular destination, the CTU applies an optimization procedure for computing an optimal route while making use of updated travel times for individual sections of roads. Thereafter, the optimal route is communicated to the MGU (Unit 10) via Internet /WAP protocol (Unit 8) and presented to the driver visually on the MGUs monitor (Unit 9) configuration in digital map format, and/or in audio form through a sequence of voice instructions to GSM mobile clients (Unit 12). Below is the list of the major functions performed by the guidance system.

Detail Description Paragraph (20):
[0064] 1. Receiving multiple-GPS locator packet (MGLP) location data from traveling vehicles via the GSM network server through packet interrogation process;

Detail Description Paragraph (25):
[0069] 6. Maintaining and updating digital geographical maps of all roads;

Detail Description Paragraph (27):
[0071] 8. Managing individual query communication via Internet/WAP server;

Detail Description Paragraph (31):
[0075] 2. Utilizing a combination of phone and voice recognition technology in WAP environment for receiving and processing driver's navigation request;

Detail Description Paragraph (32):
[0076] 3. Communicating driver's navigation request to CTU;

Detail Description Paragraph (36):
[0080] 1. Utilizing GSM/GPS or other wireless technology for providing reliable connection among the CTU, telecommunications operator stations, and MGUs;

Detail Description Paragraph (37):
[0081] 2. Transmitting GSM/GPS location data from MGUs to CTU via telecommunications service operator stations when relevant handset units are located in the mounting receptacles;

Detail Description Paragraph (40):
[0084] 5. Transmitting appropriately coded information on calculated routes from CTU to MGUs via internet/WAP Server.

Detail Description Paragraph (55):
[0099] 14. Online traffic accidents and weather reports

Detail Description Paragraph (56):
[0100] The Guidance System comprises the Central Traffic Unit (CTU), Mobile Guidance Units (MGU), and the communication System (COS).

Detail Description Paragraph (57):
[0101] FIG. 1 is a schematic representation of the information exchange between CTU, MGUs and the GSM Network Server in the Guidance System as described in detail in the Brief Description in the Overview of the Guidance System. The CTU is configured to utilize GSM/GPS or other wireless technology for receiving location data from a fleet of moving vehicles equipped with MGUs that are traveling and thereby passively collecting sample traffic congestion data along a broad range of road systems. Location data are temporarily stored on GSM Network Server in Multiple-GPS Locator Packet (MGLP). The CTU Server accesses the MGLP data on Network Server via Automatic Packet Interrogation process and stores the relevant information. The CTU processes these location data, converts them into travel time data, and stores them in the database to be later used as regular travel time data and current travel time data. Those data will be used for calculating fastest routes for the clients. The COS function is to provide reliable connection among the CTU, telecommunications operator stations, and MGUs. Initially, the COS must identify and process relevant GSM/GPS data when the corresponding handset units are located in the mounting receptacles of the travelling vehicles. The receptacles are controlled and accessed by a built-in Smart card located in the vehicle. This card initiates the GSM Network communication using hybrid GSM/GPS positioning devices and communicating their GPS positions to CTU Server at preset time intervals. The vehicle's real time position data are transmitted via separate Mobile Phone Telematics Protocol (MPTP) and contain relevant location data; the present position, the position time, and their IDs. The MTPT protocol does not interfere with the regular mobile user communication, and the COS manages and channels the Signalling Telematic location data from all signaling cell phones/vehicles. COS also manages all client requests for fastest route alternatives from a given location to a desired destination. Several possible configurations of communication modes are presented in FIG. 2: basic configuration with cell phone exclusively 31 and PC handheld with additional storage memory 32. The GSM client using a cell phone 31 may enter his navigation query via voice service 33 to the GSM network service 34 and CTU automatic voice processor 35. In return, COS passes the travel navigation instructions from the CTU to the client also via the GSM/GPS telecommunication system 36 in form of series of voice commands. Where the manual input is available on the cell unit 41, the client may also enter the SP and DP manually 37. In the mobile PC Client MGU or other handheld configuration 39, the request is transmitted by means of standard navigational query selection process in a PC Internet/WAP software application 38 and transmitted via GSM telecommunication network to Internet/WAP server 40. Internet Server maintains database and can process all individual requests in real time. Calculated route is then transferred via Internet/WAP application code to the user. Due to the size limitations of the cell-phone LCD displays, it will be desirable to provide an independent on-vehicle A.backslash.V color monitor with full connection capabilities to the cell-phone. The navigation directions will be also be returned via TCP/IP protocol in form of digital map and driving Text/Voice instructions. All potential clients and trip planners including usual WEB users can access the online Guidance System via Internet browsers. These WEB users could receive the shortest path solution by entering the origin SP and destination DP points. The real time guidance could be made available in number of geographical regions depending on distribution and availability of signaling vehicles in that region.

Detail Description Paragraph (58):
[0102] In regions, where the real time jam information is temporarily not available, the user could still receive the shortest route based on statistical traffic data. COS also enables other transmission capability for GSM such as General Packet Radio Services (GPRS). MGUs can benefit from high-bandwidth data traffic without having to wait for the phone to dial, as they do with a circuit switched call. Full time connectivity is ideal for navigational data access and information transmission with Internet-type networks based on TCP/IP protocol. The GPRS protocol is more common in a dedicated intranet navigational environment. Further details on the GPRS protocol may be found in Patent Refinements section.

Detail Description Paragraph (59):
[0103] FIG. 3 shows the major components of the MGU with CPU configuration. 61 shows the cell phone handset unit equipped with GSM/GPS antenna capable of transmitting location data to GSM Network Server. The handset unit may or may not be located in the mounting receptacle in 63. The function of the smart card in 62 is to detect when the

handset is indeed located in the mounting receptacle and can begin to report the vehicle positions to the CTU. In this configuration the handset unit is connected to on-vehicle computer CPU in 64. The computer stores all the navigation instructions received from CTU. The instructions are displayed on the display 65 and communicated by voice through audio system in 66. The driver can enter all navigation queries and additional requests via keyboard 67, or optionally by voice commands through audio system 66.

Detail Description Paragraph (60):
[0104] FIG. 4 shows the major components of the MGU with cell phone GPS/GSM configuration. In this configuration the cell phone 81 can still function both as GPS location data transmitter as well as a user communication device. The user can enter navigation queries via the cell phone input buttons 85 or by voice commands 84 directly to the CTU server. However, the amount of navigation information data that the user can receive concurrently is more limited unless the cell unit is connected online to the Internet/WAP server. It should be noted that in this configuration GPS capabilities are an advantage but not absolutely necessary for navigational directions and the user can enter his or her queries including the starting position by voice to CTU.

Detail Description Paragraph (61):
[0105] FIG. 8 illustrates the functions of MGU's mobile PC Display Panel (Unit 1). In the preferred embodiment the display unit is color CRT or a touch screen color display device easily accessible to the driver. The travel maps received from CTU are displayed on the screen and the present vehicle location can be observed on the map. The driver enters the starting point SP and the desired destination point DP in Unit 2 and may specify route preferences by selecting the shortest Travel Time (option 3) or shortest Travel Distance (option 4). Additionally, the user may also enter preferred travel route by selecting specific roads (option 6) and receive automatic path recalculation (option 5). Route requests can also be obtained via voice commands decoder in the audio controller Unit 12. When the desired optimal path is received from the CTU, the driver is notified by audio Unit 12 from the speaker, and simultaneously receives the updated path on the screen. He will be able to record any unusual or sudden traffic problems locally on MGU input (Unit 7) and in addition may enter any items of interest such as various entertainment and shopping locations connected to his travel route and accessed in future by simple query in Unit 8.

Detail Description Paragraph (65):
[0109] The guidance system begins processing user's request for an optimal route, as shown in FIG. 6, block 131 by looking at destination point DP received from the user. For the vehicle's origin point SP, the application uses the default of the current vehicle position in block 135 as obtained by GSM/GPS in block 132 unless otherwise specified by the user (blocks 3 and 4). In block 136, the route-planning algorithm calculates the optimal route while using multilevel map database (block 137), requesting travel times for various sections from the section travel time managing algorithm in block 138 (see details in FIG. 7), and using the returned section travel times for further processing. In block 139, the shortest route calculated in block 136 is communicated to the user via the communications system, and in block 140 is displayed on the display unit (signs to be shown on a map and/or audio directions).

Detail Description Paragraph (67):
[0111] The vehicle's display is an MGU mobile PC display panel. FIG. 8 is a view of the layout of a CMU display panel 180 according to a preferred embodiment of the present invention. A screen display includes a localised map display 181. Text displays include Route Preference information including start and destination information 182, Shortest Time estimate 183, Shortest Distance estimate 184, Path Recalculation data 185 and User Input data 186. Text displays for Travel Information include User Input 187 and User Query 188. Further text information under the category Traffic Information includes Accident Information 189, Accident Query 190 and Road Closures 191. Audio/Video display information includes Voice Commands 192 and Channel Selection data 193. The above are exemplary in nature and the displays can be changed or customised as desired by the manufacturer and user, and according to the information specified by the user.

Detail Description Paragraph (68):

[0112] In the preferred embodiment the MGU's mobile PC Display Panel 181 is color CRT or a touch screen color display device easily accessible to the driver. The travel maps received from CTU are displayed on the screen 181 and the present vehicle location can be observed on the map. The driver enters the starting point SP and the desired destination point DP at 182 and may specify route preferences by selecting the shortest Travel Time 183 or shortest Travel Distance 184. Additionally, the user may also enter preferred travel route by selecting specific roads 186 and receive automatic path recalculation 185. Route requests can also be obtained via voice commands decoder in the audio unit 192. When the desired optimal path is received from the CTU, the driver is notified by audio unit 192 from the speaker, and simultaneously receives the updated path on the screen. He will be able to record any unusual or sudden traffic problems locally on MGU input 187 and in addition may enter any items of interest such as various entertainment and shopping locations connected to his travel route and accessed in future by simple query 188. In addition, the driver may receive both audio and visual summary of all traffic situations and slowdowns 189-101 in the particular zone he is traveling in, all in real time.

Detail Description Paragraph (72):
[0116] 2. Roads that carry large volumes of traffic;

Detail Description Paragraph (75):
[0119] When a vehicle is traveling along a road in category A, it is supposed to communicate its location coordinates enough times to allow for accurate estimation of the travel time for that specific road within a given time period. It is expected that doing real time traffic monitoring on the roads in category A alone will help to keep the volume of relevant calculations under control. It should be noted that the division of roads into categories A and B might not exactly correspond to the conventional classification into types such as interstate highways, state highways, etc. It is only being done for the use in data processing and constitutes an important part of preliminary database tuning.

Detail Description Paragraph (76):
[0120] A straightforward method to make this division may be based on conventional road types. For example, interstate highways, state highways, national roads and some major streets might be grouped into category A, with the remaining ones into the category B. FIG. 9 shows a flowchart of Road Type Classification based on a conventional road map. Each road is identified according to its type and code such as Interstate, State, and National codes, and is as processed according the above-mentioned criteria. Accordingly, each road is grouped into category A or category B as appropriate. An algorithm for doing this is shown in FIG. 10. In this manner a list of all A roads is created before the traffic volume coefficients in category A roads can be assigned. It should be noted that many roads may be further subdivided into smaller road sections and recorded separately with their individual origin point and endpoint coordinates, as well as the section ID, name, length, etc.

Detail Description Paragraph (77):
[0121] A more sophisticated division could be done by a more complex classification algorithm that performs classification based on type, maximum allowed speed, road length, road width, average traffic volume, registered average traffic volume (if available). Such an algorithm will have an obvious advantage of being able to perform automatic classification. Its apparent disadvantage is that it may still not satisfy some of the criteria outlined above. Furthermore, experience gained in utilizing the guidance system for some time may show desirability of including additional roads into category A, or moving others into category B. As an example, consider an average traffic volume which is an important factor in classifying a road into category A or B. This factor may be unavailable at the beginning of the guidance system functioning, and moreover, it may be changing over time. However, after the guidance system has been operative for a period of time, and enough statistical data on traffic loads has been collected, we can introduce corrections into original subdivision of roads into categories A and B. Therefore, it appears unwarranted to try to rely solely on automatic classification, and a possibility of human intervention should be provided for at all stages of the guidance system functioning.

Detail Description Paragraph (79):
[0123] In the present Embodiment, all updates of proposed routes are done on both

statistical (empirical) travel times and current travel times. It appears, however, that such updating made on a global scale may not be practical. Consider an example. A driver presently situated in Jerusalem requests a route through Haifa. Obviously, present traffic jams in Jerusalem may be relevant while planning a route while those existing presently in Haifa are not since the traffic situation in Haifa is subject to change by the time the driver arrives there. On the other hand, by the time the driver arrives in the neighborhoods of Haifa, the traffic jams there if any, may become relevant for recalculating of the route. Therefore, it seems logical while planning a route to use different travel times in different locations, in particular, to use current travel times in the vicinity of the present position of a vehicle, and at the same time to use statistical travel times elsewhere.

Detail Description Paragraph (80):
[0124] A large geographic area may be subdivided into a set number of subregions, a simple division consisting of squares in a regular grid. The size and division of the grid is predetermined by a number of criteria such as road density and average volume of traffic. A zone may be defined as a group of squares put together for a particular task. In particular, a zone of nine contiguous squares is called a neighborhood of its central square. For example, in FIG. 11, the zone (1,2,3,5,6,7,9,10,11) is identified as the neighborhood of the square 6. When a vehicle enters a square, say, square 6, its IMU database receives the updated information required for optimal navigation in that particular square and in its neighborhood (1,2,3,5,6,7,9,10,11). This information is specific traffic load data pertaining to that neighborhood. It is grouped accordingly to all vehicles situated inside of that square at preset time intervals, say, each 15 minutes. If the updated data is different from the previously stored data, then the CTU database will automatically replace the old data and recalculate an alternate route. If so desired, the driver will be given an option to continue on the previous route (see display in FIG. 8, Unit 6). As a vehicle moves from square 6 to square 7, in FIG. 11, it receives the updated partial route related to square 7 and reflecting the traffic load within its new neighborhood (2,3,4,6,7,8,10,11,12). Thus, updating of the relevant traffic jam information is done only on the local zone basis.

Detail Description Paragraph (82):
[0126] Travel speeds along roads of various types (see FIG. 9) can be obtained from the maximum allowed travel speed and by multiplying it by corresponding speed coefficients, so that traveling along any particular road is assumed to be done with a speed pertinent to the type of that road. The resulting speeds will be called the theoretical speeds (see below), and the corresponding coefficients will be stored in a database in advance and provided on request. However, theoretical speeds are relevant only to ideal cases and will be probably never utilized except between midnight and early hours in the morning and even then under particularly favorably conditions. There are many reasons for this such as traffic congestion in rush hours, less than perfect road conditions, unfavorable weather conditions, falling trees, public gatherings, demonstrations, and probably a host of other factors that are difficult to enumerate.

Detail Description Paragraph (84):
[0128] 1. Generally stable changes in road conditions known in advance like closed roads under construction, traffic reroutes, changes in traffic arrangements because of visiting dignitaries, etc.;

Detail Description Paragraph (86):
[0130] 3. Sudden unpredictable changes such traffic accidents, traffic congestion due to sudden and drastic changes in weather conditions, etc.

Detail Description Paragraph (88):
[0132] FIG. 7 shows the Section Travel Time Managing Algorithm from Unit 135 in FIG. 6. Block 151: A section of the road for processing is received from Route-Planning Algorithm (Block 157 in FIG. 6). Block 152: If the section is opened for traffic, go to Block 154, otherwise in Block 153 a long travel time is put on it to make it unlikely to be selected for traveling by the route-planning algorithm. Block 154: If the section is in category A, calculate travel time for it in Block 155 (see FIG. 12 for details), otherwise use a regular travel time extracted from the database (Block 156). In Block 157, the calculated travel time on the section is sent to the

route-planning algorithm (see Block 156 in FIG. 6).

Detail Description Paragraph (89):
[0133] Factors in the second category can probably be better accounted for busing statistical tools, i.e., by collecting statistics on travel times along particular roads or particular types of roads, at particular hours, at particular days of the week, etc. Being averages by necessity, those statistical or empirical travel times will nevertheless be much better approximations to reality than theoretical times often used in similar navigation systems. As the time passes by and enough statistics have been collected, the theoretical times are replaced by the corresponding empirical, i.e., statistical travel times based on which the corresponding empirical speed coefficients may be calculated and used instead of the theoretical speed coefficients (see calculation of empirical travel times in the section Regular Empirical Travel Times below).

Detail Description Paragraph (90):
[0134] As to factors in the third category, it appears that even empirical travel times may be unsuitable for describing traffic conditions arising from sudden and unexpected circumstances which might drastically influence traffic conditions, so that the present guidance system takes care of such eventualities by creating and updating special data structures associated with all roads in category A. Any slowdowns on those roads reflected in excessive travel times of vehicles are identified and stored in the database for a limited period of time and may be utilized if and when relevant (see FIG. 13 and the accompanying description in the section Current Travel Times.). This last feature provides the present invention with truly real time capabilities.

Detail Description Paragraph (92):
[0136] By utilizing GSM/GPS technology, or GSM technology, or other wireless technology, the CTU tracks the positions of MGUs and updates in real time the database of travel times for all roads. In response to a request from a driver for a route update from his present position to a desired destination, it calculates the desired fastest route by utilizing both the regular travel times along segments of roads and predicted current travel times found by using information collected from tracking routines. Thereafter, the route is communicated to the driver. FIG. 13 shows structured diagram of the CTU database and the corresponding information and control flows. The signals carrying GSM/GPS location information are received from vehicles (block 271) and are utilized for processing statistical database times (block 272) and current travel times (block 273). An important function of the CTU database is maintaining and updating geographical maps of all major and minor roads divided according to geographical zones (Units 5 and 6). The CTU database also stores all the data relevant to particular zones such as coordinates of their squares on the grid (block 274). In block 275 the travel time data is combined with geographical data, grouped according to geographical zones (numbered from 1 to N), and stored for future use. Intervention of human Administrator is possible at this stage (block 277). All information relevant to the roads such as distances, allowable speeds, traffic lights, traffic intersections, and traffic directions is also grouped according to geographical zones and stored in the CTU database. Everything associated with each particular zone is stored in the CTU database as one structure (Units 8-12): theoretical travel times, regular (statistical) travel times, the updated traffic data associated with category A roads and all necessary data for computation of current travel times, accident and weather reports. After new routes based on zone traffic updates have been prepared (block 283), they are sent to MGUs (block 284).

Detail Description Paragraph (94):
[0138] The present guidance system can also account for rapid unpredictable changes in road conditions by maintaining special data structures associated with all category A sections that make it possible to store information such changes and use them for predicting fixture traffic conditions within a short time range. The key elements of those data structures ordered lists of travel times of the vehicles that have recently left the corresponding sections are maintained and permanently updated in the CTU database for calculations of real time optimal routes (see more details in the section Current Travel Times below).

Detail Description Paragraph (96):
[0140] For the present guidance system, a reasonable degree position accuracy for MGUs

or cellphones is required. While the FCC wireless industry standards have mandated accuracy of 125 m in locating cellphone positions, the GSM network is still far from achieving this goal. For the purposes of the present invention, the most promising direction appears to be the combination of GPS-based methods together with GSM network base stations triangulation methods. GPS performs well in suburban and rural areas where there is unobstructed view of the sky and also in dense urban areas where there are severe multipath conditions due to the fact the GPS is a dynamic system with constantly moving satellites. In order to accommodate GPS in a handset, additional basic functions must be provided: 1. Antenna function, 2. Receiver function, 3. Processing function. At present, all these functions have already been incorporated in several cellphone models at some additional cost. For the present invention, it is estimated that 5% to 10% of vehicles equipped with GPS/GSM GSMs will be quite sufficient for accurate determination of traffic load patterns.

Detail Description Paragraph (102):
[0145] The CTU monitors all MGU vehicles and registers their travel times along a sample of sections of roads by processing their GSM/GPS signals. Thus obtained empirical, or regular, travel times are averaged, transformed into empirical speed coefficients and stored in the CTU database as attached to all sections of roads according to a number of categories: type of road, day of the week, month in the year (this may help to account for seasonal changes between summer and winter etc.), various combinations of working days or holidays, holidays for students and school pupils, time of the day. FIG. 14 and FIG. 15 called Tables of Administrator show the basic structure of this part of the CTU database. When sufficient data have been accumulated for accurate enough estimation of mean (regular empirical) travel times for each individual section in category A and for each class in category B, the CTU is able to provide those regular empirical travel times rather than theoretical travel times TTT (see FIG. 16).

Detail Description Paragraph (112):
[0155] The above construction might be inefficient for sections of considerable length for which traveling could take a long time. In such cases, considerable delays in measuring travel times could cause time estimates to be obsolete by the time they have been computed. Still, the described method can be amended (without attempting to measure vehicle speeds in traffic jams) as follows. A long section is cut into two artificial subsections and a dummy intersection is introduced between them. The two lists as described above are maintained in the database for each subsection. The traveling times for the subsections will be reduced by half, and more accurate estimates could be obtained.

Detail Description Paragraph (129):
[0170] For SP2 and each of its neighbors, we can construct a dummy arc with the length equal to the shortest path between them. These dummy arcs for all neighbors of SP are added to the network of large roads, which thereafter is called the extended network, see FIG. 23. These dummy arcs may or may not coincide with real sections on the map. For instance, the dummy arc (SP2, N3) in FIG. 23 does not coincide with any real section although its length is equal to the shortest path from SP2 to N3. Now running algorithm A* on the extended network, we obtain the shortest path (SP2, N3, A, DP) from SP2 to DP where (SP2, N3) is a dummy arc from SP to its neighbor N3, and (N3, A, DP) is a real path on the network of large roads. Finally, we replace the dummy arc (SP2, N3) by the corresponding shortest path from SP2 to N3 on small roads found by A* in a separate search, and combine the two paths to obtain the solution. The case when the destination point is not on a large road is treated similarly.

Detail Description Paragraph (130):
[0171] FIG. 24 shows the flowchart of algorithm Z. A request for optimal route from the origin point SP to the destination point DP is received from the user in block 451. In block 452, the origin and destination points are checked to be located on large roads; if they do not, their neighbors are constructed and added to the network of large roads to make an extended network. In block 453, an optimal route from SP to DP is calculated on the extended network by algorithm A*. In so doing, the multilevel map database is queried for updated travel times (block 455). In block 454, an optimal route from SP to one of its neighbors is calculated by algorithm A* on the network of small roads. Similarly, in block 456, an optimal route from a neighbor of DP to DP is calculated. The obtained routes are combined into the final route in block 457, which

is passed to the user in block 458.

Detail Description Paragraph (132):
[0173] It is easy to construct mathematical examples when the above method may produce suboptimal solutions. In the example in FIG. 21, the passing by a small road from N4 to A has never been considered by algorithm Z. Still, it appears that for real maps such cases are extremely rare, and even when they happen, the losses of optimality will be negligible.

Detail Description Paragraph (134):
[0175] The MGU client could initiate queries to the CTU such as real time information on favorite restaurants, clubs, sports facilities etc., directly from CTU. Similarly, the driver may select A/V broadcast, lecture etc., available in the CTU broadcasting library. By using another transmission capability for GSM such as General Packet Radio Services (GPRS), MGUs can benefit from high-bandwidth data traffic without having to wait for the phone to dial, as they do with a circuit switched call. Full time connectivity is ideal for database access service and information transmission with Internet type networks based on TCP/IP protocol. This will enable operators to provide other services such as Internet WAP pages, advertisement announcements, and entertainment material at no additional cost.

Detail Description Paragraph (135):
[0176] GSM/GPS tracking capability of client vehicles MGUs individually could also enable various conventional security-related applications such as vehicle monitoring, warning and alarm systems and tracking applications without additional hardware additions or changes. As long as the cell phone is located in the vehicle receptacle, it can be monitored with interactive tracking/dispatcher application and its current GSM/GPS coordinates recorded without any user input. All position information can be accessed by the user via built-in functions such as cell phone's emergency location call (911). The guidance system can naturally access all vehicle location information anonymously and utilize it for development of real time traffic jam predictions.

Detail Description Paragraph (136):
[0177] Online Traffic Accidents and Weather Reports

Detail Description Paragraph (137):
[0178] In this refinement, the CTU database administrator can utilize most recent information on various traffic accidents and road disturbances reported by reliable sources. These are generally reported as static news items and presented in various formats. The administrator can enter these data directly into the CTU database together with the geographical location, time of the event, expected duration, etc. Similarly, the administrator can record all weather reports and road conditions as related to specific regions. These data can then be entered into the CTU database as related to specific zones together with other traffic data as a part of regional or zone traffic report.

Detail Description Paragraph (139):
[0180] While the management of large amounts of temporary traffic data could be rather involved, the improvement of updating capabilities would be dramatic, especially in zones with large number of road incidents and frequent weather changes.

Detail Description Paragraph (140):
[0181] One embodiment of the invention can be used to provide statistical traffic reports and data collection of vehicle movements along federal, state, municipal and rural regional road networks. At present, these agencies rely mostly on extensive manpower resources as well as mechanical, electronical and optical installations for obtaining statistical traffic data. It is proposed here to use the travel time information obtained by MGU-equipped vehicles to enable studies of long-term traffic data and their accumulated effects on optimal traffic flows in specific geographical regions. For this application it would be useful to develop correlation between vehicle travel times on specific road section and the number of vehicles traveling in that road section at a given time period.

Detail Description Paragraph (141):
[0182] After slight changes, the application could classify and tabulate traffic data

in each zone and produce daily, monthly and yearly traffic charts. The statistical traffic reports can then be made accessible to all the agencies mentioned above, as well as to public in general via electronic and other media.

Detail Description Paragraph (143):
[0184] It is easy to construct mathematical examples when the suboptimal solutions are obtained. In the example in FIG. 21, the passing by a small road from N4 to A has never been considered by algorithm Z. Still, it appears that for real maps such cases are extremely rare, and even when they happen, the losses of optimality will be negligible.

Detail Description Paragraph (144):
[0185] The inventive system may further be useful for various other traffic analysis functions. Statistical information gathering for government road design and traffic planning agencies may be obtained. Such an arrangement would consist of statistical traffic reports and data collection of vehicle movements along federal, state, municipal and rural regional road networks. At present, these agencies rely mostly on extensive manpower resources as well as mechanical, electronic and optical installations for obtaining statistical traffic data. It is anticipated that the travel time information obtained by MGU-equipped vehicles will be used to enable studies of long-term traffic data and their accumulated effects on optimal traffic flows in specific geographical regions. For this application it would be useful to develop correlation between vehicle travel times on specific road section and the number of vehicles traveling in that road section at a given time period.

Detail Description Paragraph (145):
[0186] After slight changes, the application could classify and tabulate traffic data in each zone and produce daily, monthly and yearly traffic charts. The statistical traffic reports can then be made accessible to all the agencies mentioned above, as well as to public in general via electronic and other media.

CLAIMS:

1. A system for real time vehicle guidance and forecasting travel times under, the system comprising: central traffic unit (CTU), mobile guidance units (MGU), and communication system (COS).

2. The system according to claim 1, further comprising: the central traffic unit connected to telecommunications operator base stations and to the mobile guidance units via the communication system; said central traffic unit utilizing wireless telephone technology for determination of location and for communication with MGUs via the communication system; said central traffic unit utilizing the GPS location data, for achieving maximum feasible precision in determining MGU positions.

3. The system according to claim 1, further comprising: the central traffic unit connected to telecommunications operator base stations and to the mobile guidance units via the communication system; said central traffic unit utilizing wireless telephone technology and GPS location for communication with MGUs via the communication system; said central traffic unit utilizing the GPS location data, for achieving maximum feasible precision in determining MGU positions.

4. The system according to claim 1, wherein the central traffic unit further comprises: a map database containing digital road maps of a predetermined geographical region, data on speed limits, road capacity, and street directional designations; a server for processing the location data received from MGUs and transforming them into structured data suitable for storage; a database suitable for storing and updating statistical data on traffic loads at least on a limited number of individual roads; a table of administrator wherein said statistical data is further subdivided according to time into subdivisions; statistical application for collecting said structured data, computing individual statistical time travel estimates for at least said limited number of individual roads, and storing the results in the table of administrator according to said subdivisions; statistical application for periodical updating of said statistical data using statistical criteria for determining volumes of data required for obtaining estimates of a predetermined validity; computational tools for dividing said geographical region into of smaller geographical zones for reducing

volumes of traffic load data broadcast to client vehicles; software for calculation of said current travel times in traffic congestion based on said travel time traffic updates, thereby minimizing reliance on vehicle speed estimates, thereby increasing the reliability and stability of resulting estimates; software for calculation of fastest travel routes using said current travel times in the zones contiguous to the vehicle while using statistical travel times in the zones situated further from the vehicle.

5. The system according to claim 4, wherein the central traffic unit further comprises: the map database containing road category data; and guidance software based on mathematical and artificial intelligence algorithms together with the map databases for calculating fastest available travel routes from the present vehicle position to the desired destination while taking into account both statistical travel times and current travel times.

6. The system according to claim 1, wherein a plurality of the mobile guidance units further comprise: mobile unit with hybrid telecommunications and GPS capabilities connected to an existing mobile telecommunications network and utilizing a GPS receiver for accurate positioning; a mobile phone telematics protocol (MPTP) connection to the a mobile telecommunications network server for real time position update; a mounting receptacle for holding mobile cell phone handset units; a sensor to identify when a mobile cell phone handset unit is located in the mounting receptacle; said mobile guidance units having a capability of accepting voice queries and transmit navigation commands; and said mobile guidance units containing computational units for storing route information and displaying in on the display unit.

8. A mobile unit for use with system which includes central traffic unit (CTU), mobile guidance units (MGU), and communication system (COS) for real time vehicle guidance and forecasting travel times under, the mobile unit comprising: mobile unit with hybrid telecommunications and GPS capabilities connected to an existing mobile telecommunications network and utilizing a GPS receiver for accurate positioning; a mobile phone telematics protocol (MPTP) connection to the a mobile telecommunications network server for real time position update; a mounting receptacle for holding mobile cell phone handset units; a sensor to identify when a mobile cell phone handset unit is located in the mounting receptacle; said mobile guidance units having a capability of accepting voice queries and transmit navigation commands; and said mobile guidance units containing computational units for storing route information and displaying in on the display unit.

9. The system according to claim 8, further comprising: the central traffic unit connected to telecommunications operator base stations and to the mobile guidance units via the communication system; said central traffic unit utilizing wireless telephone technology for determination of location and for communication with MGUs via the communication system; said central traffic unit utilizing the GPS location data, for achieving maximum feasible precision in determining MGU positions.

10. The system according to claim 8, further comprising: the central traffic unit connected to telecommunications operator base stations and to the mobile guidance units via the communication system; said central traffic unit utilizing wireless telephone technology and GPS location for communication with MGUs via the communication system; said central traffic unit utilizing the GPS location data, for achieving maximum feasible precision in determining MGU positions.

11. The system according to claim 8, wherein the central traffic unit further comprises: a map database containing digital road maps of a predetermined geographical region, data on speed limits, road capacity, and street directional designations; a server for processing the location data received from MGUs and transforming them into structured data suitable for storage; a database suitable for storing and updating statistical data on traffic loads at least on a limited number of individual roads; a table of administrator wherein said statistical data is further subdivided according to time into subdivisions; statistical application for collecting said structured data, computing individual statistical time travel estimates for at least said limited number of individual roads, and storing the results in the table of administrator according to said subdivisions; statistical application for periodical updating of said statistical data using statistical criteria for determining volumes of data

required for obtaining estimates of a predetermined validity; computational tools for dividing said geographical region into of smaller geographical zones for reducing volumes of traffic load data broadcast to client vehicles; software for calculation of said current travel times in traffic congestion based on said travel time traffic updates, thereby minimizing reliance on vehicle speed estimates, thereby increasing the reliability and stability of resulting estimates; software for calculation of fastest travel routes using said current travel times in the zones contiguous to the vehicle while using statistical travel times in the zones situated further from the vehicle.

12. The system according to claim 10, wherein the central traffic unit further comprises: the map database containing road category data; and guidance software based on mathematical and artificial intelligence algorithms together with the map databases for calculating fastest available travel routes from the present vehicle position to the desired destination while taking into account both statistical travel times and current travel times.

14. A method for real time vehicle guidance and forecasting travel times under, the method comprising: providing central traffic unit (CTU), mobile guidance units (MGU), and communication system (COS); connecting the central traffic unit to telecommunications operator base stations and to the mobile guidance units via the communication system; using said central traffic unit for determination of location and for communication with MGUs via the communication system by utilizing wireless telephone technology; using said central traffic unit and the GPS location data, for achieving maximum feasible precision in determining MGU positions.

15. Method according to claim 14, further comprising: connecting the central traffic unit connected to telecommunications operator base stations and to the mobile guidance units via the communication system; utilizing wireless telephone technology and GPS location for communication with MGUs via the communication system; utilizing the GPS location data, for achieving maximum feasible precision in determining MGU positions.

16. Method according to claim 14, further comprising: providing a map database containing digital road maps of a predetermined geographical region, data on speed limits, road capacity, and street directional designations; processing the location data received from MGUs and transforming them into structured data suitable for storage; storing and updating statistical data on traffic loads at least on a limited number of individual roads; further subdividing said statistical data according to time into subdivisions; collecting said structured data, using the structured data to compute individual statistical time travel estimates for at least said limited number of individual roads, and storing the results according to said subdivisions; periodically updating said statistical data using statistical criteria for determining volumes of data required for obtaining estimates of a predetermined validity; dividing said geographical region into of smaller geographical zones for reducing volumes of traffic load data broadcast to client vehicles; calculating said current travel times in traffic congestion based on said travel time traffic updates, thereby minimizing reliance on vehicle speed estimates, thereby increasing the reliability and stability of resulting estimates; calculating fastest travel routes using said current travel times in the zones contiguous to the vehicle while using statistical travel times in the zones situated further from the vehicle.

17. Method according to claim 15, further comprising: storing road category data in the map database; and using mathematical and artificial intelligence algorithms together with the map databases for calculating fastest available travel routes from the present vehicle position to the desired destination while taking into account both statistical travel times and current travel times.

18. Method according to claim 14, further comprising: providing a plurality of mobile unit with hybrid telecommunications and GPS capabilities connected to an existing mobile telecommunications network and utilizing a GPS receiver for accurate positioning; using a mobile phone telematics protocol (MPTP) connection to the a mobile telecommunications network server for real time position update; using said mobile guidance units to accept voice queries and transmit navigation commands; and storing route information and displaying said route information in display units associated with said mobile units.

20. Method according to claim 14, further comprising using information gathered by the CTU for developing statistical traffic data.

21. Method according to claim 14, further comprising using information gathered by the CTU for developing statistical traffic data and data collection of vehicle movements along federal, state, municipal and rural regional road networks, including developing a database of long-term traffic data and their accumulated effects on optimal traffic flows in specific geographical regions.